THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. APRIL 15, 1897. CHICAGO, ILL. NUMBER 15.

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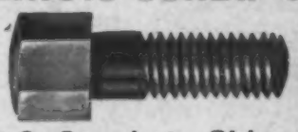

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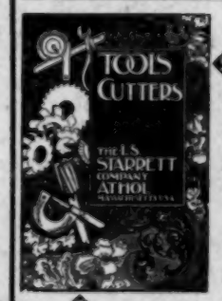

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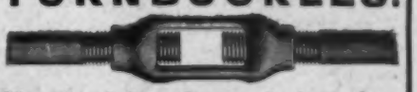

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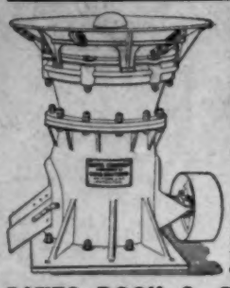

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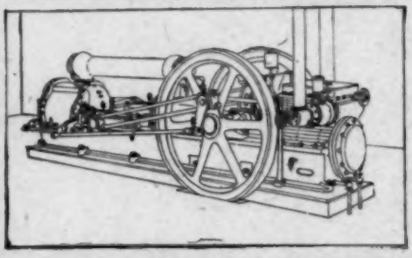

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. APRIL 15, 1897. CHICAGO, ILL. NUMBER 15

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade is still straining for lower prices in most finished material lines, and the pressure upon sellers of primary and intermediate products—ore, pig iron, steel billets—to put their prices at corresponding figures grows stronger. Meantime, the squeezing up of profits, that gives one margin, instead of four or five, between ore and the ultimate product, is making the situation still harder for concerns whose raw material is two or three stages removed from the ore. So far as Lake Superior ores are concerned, the prices for '97 are admittedly profitless. Furnacemen are giving away the lower price of Bessemer ore before they get it, and makers of foundry and mill irons will need all the reduction afforded them by a $2 and a $2.25 basis respectively, for Mesabi and old-range non-Bessemers. From the present outlook, Southern iron will have to go quite below a $6.50 Birmingham basis for No. 2 foundry to meet the Northern product in the latter's natural territory. The blast furnace statement shows that while there are stoppages, resumptions also keep up, and the net balance is on the production side while stocks increase with each month. Demand must grow greatly to bring any early approach to healthy condition. Specific examples of the present tendency have been given in nearly all markets the past week. Bessemer pig iron at Pittsburg has sold at $10, equivalent to $9.35, valley furnace, and one transaction is reported at $9.95, Pittsburg. Steel billets share in the weakness of Bessemer iron and while the quotation of $15 maker's mill is made, this figure can be shaded for early deliveries. The reduction on freight on east-bound pig iron and billets and blooms has been made, effective April 19, the Joint Traffic Association ratifying the schedule which reduces pig iron to $3.75, Chicago to New York, and billets and blooms to $4.35. This gives a 30-cent reduction in freight on billets from Pittsburg to the seaboard. Like all other reductions of the sort, the difference goes at once to the consumer and the Philadelphia quotation on billets is $17.25, with $17 regarded as a possibility. Railroad buying has been checked by recent events, and specifications on rail purchases are not all that could be desired. There is little disposition to name a time for the appearance of distinctly better demand. The Senate will take more time than was once thought, on the tariff bill, and the second quarter of the year will probably be well gone before the vote. In line with the recent anti-railroad-pool decision, proceedings have been instituted a second time against the six cast iron pipe concerns that have worked under the bonus arrangement in bidding for contracts. Tin plate manufacturers are confining business to the second quarter and are maintaining quotations 30 cents higher since the Chicago meeting. Plates, angles and bars average fully $1 a ton lower than ten days ago.

THE CLEVELAND DISTRICT.

Further acquaintance with the schedule of prices for old range Bessemer ores does not bring satisfaction with it, to the interests involved. The belief is expressed by many that the pendulum has swung too violently toward cheapness and that for a great industry to decide practically to give away its product is not a procedure calculated to assist in bringing in the much-needed revival. It is to be expected that some Bessemer properties, to which allotments have been made, will not be producers this year. To some the basis is simply prohibitive. The amount apportioned, therefore, is not a measure of the amount that will be produced. Little disposition is shown, by the average buyer of ore, to take hold, now that prices have been made. The indications are that, as was the case last year, ores for rail steel, some of the choicest of the low-phosphorus grades, will be taken up earliest, and there is some preliminary figuring in this direction. The questions as to possible reductions in rail freights from mines to upper lake docks, much discussed of late, are being canvassed in a meeting of the ore-carrying roads at Chicago this week. The merging of railroad and mining interests on the Mesabi range presents a complication that may yet seriously disturb the relation of freight rates on the different ranges. As indicating the close adjustment of values on old-range Bessemer ores, on the basis outlined elsewhere, we quote some of the prices established: Minnesota, $3.11; Chandler, $2.92½; Pioneer, $2.87; Norrie, $2.65; Aurora, $2.80; Ashland, $2.66; Tilden, $2.56; Montreal, $2.77; Chapin, $2.40; Republic specular, $3.17; Republic special, $3.40; Lake Superior low phosphorus, $3.42; Lake Angeline hard, $3.46; Angeline hematite, $2.82. The basis of Mesabi Bessemers has been indicated heretofore by the quotation of $2.40 on Fayal ore. Some ores on that range will go somewhat higher, these including Franklin, Biwabik and the Lake Superior group. The ores of the Hull, Burt and Rust mines, constituting the last named, run 65 to 65.5 in iron, .025 to .035 in phosphorus and 9 to 9.5 in moisture. Figuring on the old-range basis, they would bring $2.90; if the Mesabi differential is reckoned at 25 cents, the market price would be $2.65.

Pig Iron A weak feeling prevails as to Bessemer iron. Valley furnacemen are piling iron, working up ores on hand. The market is $9.35 to $9.50 in the valley, with few sales reported except through Pittsburg. Foundry irons have declined further and $9.50 for No. 2 in the valley, is now general, while $9.25, and even lower, is reported possible. Gray forge has shared in the decline and is sold at $8.25, valley furnace. Lake Superior charcoal is fairly active at $13.25 to $13.50, Cleveland. We quote for Cleveland delivery:

Bessemer	$10 00	Valley Scotch No. 1	$10 75@10 90
No. 1 Strong Foundry	10 65@10 90	Valley Scotch No. 2	10 25@10 50
No. 2 Strong Foundry	10 00@10 25	Gray Forge	8 90@ 9 15
No. 3 Foundry	9 65@ 9 75	Lake Superior Charcoal	13 50

Finished Material. A weaker market is reported in bar iron, plates, angles and bar steel. It would appear that 1c. is not minimum on bar iron, close competition on recent Northern Ohio business bringing out a price close to 1c. on sizes carrying from 10c. to 15c. as half extras. Bessemer plates are sold on a 1c. basis, Pittsburg, and angles are quoted 1.10c Cleveland. Some sharp competition is noted between Pittsburg and Chicago plate mills, on recent Northern Ohio contracts. Wire is still sold at $1.10 in car load lots and $1.15 for less. Wire nails, under recent strike troubles are firmer and $1.40 to $1.45 Cleveland, is quoted. The HP Nail Co.'s men have returned to work, waiving the Saturday half holiday.

CHICAGO.

OFFICE OF *The Iron Trade Review*, }
1142 MONADNOCK BLOCK, April 14 }

Very little of interest occurred last week, and the market is so quiet as respects inquiry that not much more business is looked for to be had for the next week or two. The most active branch of the market was steel, a large tonnage of billets having been closed at prices under those which have been quoted of late. There are further inquiries in the market, but it is not sure they will be closed immediately. Other branches of the market did not show any activity, and sales were limited to small lots in almost every case. The South works of the Illinois Steel Co. were closed down most of last week because of a strike of the rail straighteners. The trouble was settled by the end of the week however, and the mills started up again on Monday of this week.

PIG IRON.—There is but a comparatively small inquiry for either Northern or Southern iron, although one or two inquiries are for lots as large as 1,000 tons. No large sales were made last week, and the small lot business was not up to that of the week before. Dealers have been looking for an increase in business for some time, and while they have not lost hope in the future, they are hardly as confident that the improvement will come soon as they were two or three weeks ago. Buyers do not seem to have much interest in the market, and it is not likely that the low prices being made increase the tonnage sold at all. Competition for such business as comes up is keen, and as long as this is the case, and demand gets no larger, there is little hope for a stronger market. Southern iron quotations are unchanged, but most of the furnaces have been asking more than the prices given. Former quotations of Northern iron are also continued, though in some instances in close competition with Southern iron, the furnaces have reduced their figures somewhat:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 1 Soft	$10 65@10 90
Local Coke Fdy. No. 1	11 25@11 75	Southern No. 2 Soft	10 15@10 25
Local Coke Fdy. No. 2	10 75@11 25	South'n Silveries	11 40@11 65
Local Coke Fdy. No. 3	10 50@10 75	Jackson Co. Silveries	14 00@16 00
Local Scotch Fdy. No. 1	11 25@11 75	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	10 75@11 25	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	10 50@10 75	Ohio Strong Softeners	12 00@12 25
South'n Coke No. 1	11 00@11 25	Alabama Car Wheel	16 00@16 50
South'n Coke No. 2	10 25@10 40	Malleable Bessemer	11 50@12 00
South'n Coke No. 3	10 00@10 15	Coke Bessemer	13 00@13 50

BAR IRON.—Last week was quiet, with only a small business closed. No large contracts were taken, and none are to come up immediately. The market is inclined to be weak, and while some mills are asking the prices given, others are making quite a little lower figures. Quotations are unchanged at 1.10c to 1.20c for common iron, and 1.15c to 1.25c for soft steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—A few orders for heavy sections were taken last week, but no very large ones. The demand for light sections continues and sales last week were very good. Quotations are made: Rails, $21 to $23, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—Sales of billets last week reached a total of 13,500 tons, with other orders in prospect. Quotations are reduced and are now made at $16.75. Rods were in light demand, and only a few small sales were made. They are quoted at $22.50.

STRUCTURAL MATERIAL.—Business last week was very quiet. Orders on old contracts are satisfactory, but new business is limited to small lots and no large contracts are in sight at present. Quotations are as follows: Beams and channels, 1.70c; angles, 1.20c to 1.25c; plates, 1.20c to 1.25c; tees, 1.45c to 1.50c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Only a limited demand is had, and sales have been small. No large contracts have been taken or are in sight. Prices are made as follows: Tank steel, 1.22½c to 1.25c; flange steel, 1.32½c to 1.35c; fire-box, 2c to 5c.

SHEETS.—Business is fair, but is principally confined to small lots. The demand does not indicate an immediate improvement. Quotations are made at 2.05c to 2.10c for No. 27 black and 80 and 7½ per cent discount on galvanized.

MERCHANT STEEL.—Most of the business placed last week was for small lots, but one or two fairly good orders were taken. The inquiry is slightly improved. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.75c to 1.85c; smooth finished machinery steel, 1.55c to 1.60c; smooth finished tire, 1.40c to 1.50c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—The demand is light and only small sales have been made. One lot of railroad iron was offered, but was not sold up to the first of this week. Prices are unchanged, but in most cases are only nominal. Prices are made at $11.75 and $12.25 for old iron rails, $8.50 to $9 for old steel rails, and $10.25 to $10.75 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $12 to $12.50; dealer's forge, $10 to $10.50; No. 1 mill, $7 to $7.50; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $14.25; cast borings, $3; wrought turnings, $4; axle turnings, $5.50 to $6; mixed steel, heavy, $7.50; stove plates, $5.50; heavy melting steel, $9 to $9.25.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, }
807 TRADESMEN'S BUILDING, April 14. }

The week brings no local indications of a clearing and the hesitation is even more pronounced than it was ten days ago. Extreme prices are discussed in connection with both pig iron and steel, and some finished lines—notably sheared plates and angles—are perceptibly weak. On the other hand a much larger tonnage of structural material now seems to be in prospect, wire products are in heavy demand, sheets are more active, so that better indications are not totally lacking. The $3.35 price on coke plates 100-lb. delivered at New York, established by the Chicago meeting of the new Tinned Plate Manufacturers' Association, marks no advance on prevailing prices, the freight rate to Eastern markets being 15c. Reduced freights on billets and pig iron, Pittsburg to New York, Baltimore, Boston, and Philadelphia take effect April 19. Freight rates on Connellsville coke have been reduced from 5 to 10 per cent both east and west.

PIG IRON.—Bessemer has shown no tendency in the week to adjust itself to some of the current ideas as to cost possibilities under 1897 ore prices. Much of the uncertainty of the previous week remains and naturally in such conditions the trend of opinion is downward. No buyer has yet tested these calculations, and the result is an indefinite market. Iron is offered in Pittsburg at $10 from middlemen, and $9.90 is said to be likewise offered. The weakness in gray forge and all grades of foundry iron grows more pronounced. A sale of 500 tons of gray forge is the only transaction reported. We quote:

Bessemer	$ 10.00
No. 1 Foundry	10.50 to 11.00
No. 2 Foundry	10.00 to 10.25
No. 3 Foundry	9.65 to 9.75
Gray Forge	8.90 to 9.00

BILLETS.—The open quotation of $15 on billets by Pittsburg mills indicates a further decline from last week, and the probability is that the figure asked could be shaded elsewhere. Three lots have been inquired for during the week, including an Eastern inquiry and another from the Cleveland district, but there is no indication that these will result in early transactions. Actual business in steel has been confined to rods, for which there is a healthy demand. While billets are quoted by Pittsburg mills at $15, offers of $14.75 from middlemen are reported.

RAILS AND TRACK SUPPLIES.—The damage to the Edgar Thomson plant having been repaired, rolling of rails was resumed last Friday. The report that efforts are being made to revive the rail pool receives no credence in Pittsburg. Track material, spikes in particular, is an active feature of the market. We quote: Splice bars, 1.40c to 1.45c; track bolts, iron, 1.95c to 2c; steel spikes, 1.65c to 1.75c.

STRUCTURAL MATERIAL.—Interest centers in work planned and upon which bids will be asked soon. The bridge to cross the St. Lawrence, at Montreal, is the largest, and bids on the steel—15,000 to 18,000 tons in all—will be opened in another week. Sections of the New Orleans drainage work are requiring estimates but no early letting is probable. Lower prices on angles and universal plates prevail. We quote Beams and channels, 15-inch and under, 1.55c; 20-inch, 1.70c; 24-inch, 1.75c; angles, 1.05c to 1.10c; universal plates, 1.05c to 1.10c; zees, 1.30c to 1.35c; tees, 1.35c to 1.40c.

PLATES.—The Minneapolis pipe contract went to the Gillette-Herzog Co., and local mills will probably supply the 600 tons

of plates. Bessemer plates are much weaker and the scarcity of business has led mills to make 1c on tank. Lower figures are rumored. Mill quotations are 1.05c. Open-hearth plates are held at last week's quotations, but the volume of business is but little better than that in Bessemer. Prices are quoted as follows: Tank, Bessemer, 1.05c; open-hearth, 1.10c to 1.15c; shell, 1.25c to 1.30c; flange, 1.35c to 1.40c.

MERCHANT STEEL.—The week's business was confined almost entirely to various grades of tool steel. Prices remain as quoted: Machinery steel, 1.30c to 1.35c, base; sleigh shoe, 1.30c to 1.35c; soft steel bars, 1.20c; machine straightened, tire, 1.30c to 1.40c; spring, 1.30c to 1.35c; open hearth spring, 1.55c to 1.60c; toe calk, 1.45c to 1.55c; tool steel, common, 5c to 7c. Special brands, 10c and upwards.

BARS.—The strike of puddlers at the works of the Oliver Iron & Steel Co., and of A. M. Byers & Co., was of short duration, the puddlers accepting the rate of $4 per ton. Some delay on orders was experienced but the volume is too small to cause much annoyance. A slight activity in muck bar is reported. Steel bars are quoted 1c to 1.05c. Pittsburg brands of bar iron are held from 1.15c upward and best muck bar iron at 1.30c.

PIPE AND TUBES—The Boston order of 3,500 tons of cast iron pipe was awarded a Southern Ohio plant at a low figure. On wrought pipe prices are quoted as follows: Merchant pipe, 57 to 67 per cent; galvanized, 50 to 55 per cent; on car load lots, six tens; less than car load lots, five tens and five per cent. On merchant boiler tubes, we quote: Two and a quarter inches and smaller, 70 and 10 per cent discount, two and a half inches and over, 75 and 5 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

IRON AND STEEL SKELP.—We quote: Grooved steel skelp, 95c to 1c; sheared, 1.05c to 1.07½c; grooved iron skelp, 1.12½c to 1.15c; sheared iron skelp, 1.25c to 1.30c.

SHEETS AND TIN PLATE.—Galvanized sheets are stronger than black and have so far maintained better prices. The demoralization in black sheets is unabated and the following quotations can doubtless be shaded: No. 26, 1.90c to 1.95c; No. 27, 2c to 2.05c; No. 28, 2.10c. Galvanized are held at 80c and five per cent off list. Stiffened prices on coke plates for tinning continue to rule and the end apparently is not yet.

OLD MATERIAL.—Quoted prices on scrap follow: Business is small and widely scattered. Wrought scrap, No. 1, $10.75 to $10.50; old iron rails, $13 to $13.50; old steel rails, $10.50 to $11; cast scrap, $10 to $10.25; hammered iron axles, $15.50 to $16, net; rolled iron axles, $13.75 to $14; machinery cast, $9.75 to $10; heavy melting stock, $12 to $12.50; coil spring, $10.50 to $11; leaf spring, $13.25 to $13.50; car wheels, $10.25 to $10.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The Southern furnaces have evidently arrived at a point where further concessions in prices mean heavy loss, and have determined to make a stand. A number of transactions of considerable size have been closed, most of them being for scattered delivery. Contrary to the usual custom of the trade, offers for spot cash, quick shipment, do not seem to possess attractions sufficient to make a break in the established quotations. Several large buyers are still testing the market, expressing a belief that freight rates will be reduced and that the necessities of furnaces will oblige them to sacrifice iron rather than to blow out. So far as can be ascertained, the railroads have no intention of making lower rates and furnace companies say that even present prices will compel a number to stop. In Northern irons the trade has continued of moderate dimensions only. It is supposed that the furnaces making iron from Lake Superior ores have been also forced down to the lowest level and a decrease in production is looked for. Reports from all sections of the country show that consumption of iron is about stationary. A few industries report an increase, but others say that their trade is no better than it was 12 months ago. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $9.75 to $10; No. 2 foundry, $9.25 to $9.50; No. 3, foundry, $9. to $9.25; gray forge, $8.75 to $9; mottled, $8.75 to $9; No. 1 soft, $9.50 to $9.75; No. 2 soft, $9.25 to $9.50; Hanging Rock charcoal, No. 1, $15 to $16; Tennessee charcoal, No. 1, $13 to $14; Jackson county silvery, No. 1, $12.50 to $13; Standard Georgia car wheel, $14.75 to $15.50; Tennessee car wheel, $13.50 to $14.50.

Buffalo. Between any two dates three or four weeks apart, an increase in the volume of business and a better tone is discernible, but this increase is so slow that from week to week the change is hardly perceptible and business carries an aspect of dragging. Transactions continue to be small and always warmly contested. Prices, while not strong, cannot be said to be weaker, and are more generally made at figures which shade some recent quotations and are made on the basis given below: No. 1 foundry, strong, coke iron, Lake Superior ore, $12; No. 2, $11.50; Ohio strong softener, No. 1, $12; No. 2, $11.50; Jackson county silvery, No. 1, $14.25; Southern soft No. 1, $11.50; No. 2, $11.

THE TIN PLATE MARKET.

The situation briefly summarized is this: Trade is dull, stocks on spot at mills light, and buyers indifferent. The following prices are asked for carload lots deliveries up to July 1st, 1897, at Middle States points:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$4.05	$4.80
Calland Grade,	4.25	5.00

COKE TINS.

Full weight, basis weight,	$3.45
100 lb. " "	3.35
95 lb. " "	3.30
90 lb. " "	3.25
85 lb. " "	3.20

TERNES.

Full weight	14 x 20	$3.45
	20 x 28	6.90
100 lb.,	14 x 20	3.35
	20 x 28	6.70

The tin plate makers' meeting at Chicago, April 6, seems to have confirmed the late advance in prices as entirely in keeping with the actual condition of affairs, which, summed up briefly, is that the mills are well supplied with orders for some months to come. Most of the makers still decline to sell for delivery beyond July 1st and are holding firm at the above prices for earlier deliveries. The present tendency of the market is towards still higher prices.

Indictments Against the "Cast Iron Pipe Trust."

At Chattanooga, Tenn., the Federal Grand Jury on April 7 returned an indictment against members of the Associated Water & Gaspipe Co., commonly known as the "Cast Iron Pipe Trust," on the charge of unlawful combination in violation of the Sherman anti-trust act. District Attorney Bible will proceed against the pipe companies composing the association. In a recent civil action in the United States Circuit Court, the Government failed to make out its case and an appeal was taken to the Court of Appeals in Cincinnati.

The six pipe works that had the arrangement complained of are the Addyston, Dennis, Long & Co., Anniston, South Pittsburg and Chattanooga. They worked under the bonus system, an executive committee fixing the minimum price on business in the territory covered by the association. As contracts come up the various concerns bid for the privilege of taking certain business and the one bidding highest is allowed to take the business, the others going above its bid. The territory covered by this arrangement was the Southern States, the Rocky Mountain region, Michigan, Minnesota, Illinois, Indiana, Ohio, and Iowa.

In the original hearing on the civil action, the court decided that the association is not subject to the provisions of the Sherman anti-trust act, and that it did not constitute a monopoly or an association in restraint of trade. It appeared from the testimony that in the territory covered by the arrangement there were other plants of large capacity and that concerns outside of this territory came into it to compete with the six plants which worked under the bonus system.

In view of the recent ruling on the Trans-Missouri Joint Traffic Association, the District Attorney holds that the Supreme court has supported his contention and he renews the attack by means of indictment.

THE IRON TRADE REVIEW

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THE PROBLEM OF BESSEMER ORE VALUES.

It was indicated in these columns last week that the prices for Lake Superior Bessemer ores of the Marquette, Menominee, Gogebic, and Vermilion ranges, as established for 1897, were the result of the closest computation, the design being to arrive at a schedule exactly representing the relative values of the various ores. It was stated that while in other years a difference of a few cents between ores of substantially the same composition was not considered reason enough to split a half-dime in making up a schedule, this year's price list, in two or three instances introduced a half-cent, in the effort to give to each ore its exact place, as determined by its composition. In this connection, a more detailed statement of the method followed in computing prices will be interesting.

The decision having been arrived at that Norrie ore would be sold at $2.65 laid down at Lake Erie dock, and that the base should be a suppositious ore containing 63 per cent of iron, .045 per cent phosphorus and 10 per cent natural moisture, the ground work was furnished. With Norrie at $2.65, the base ore figured out $2.60. But the problem that involved days of conference and computation was to express fairly the actual relative value to the furnaceman of the 45 or 50 ores in the list, so that each should stand in the list just where it would go as a component of the resulting pig iron, with the furnaceman's sharpest pencil figuring on the mixture. The procedure adopted in getting the basis of a formula, really involved taking the ore into the Mahoning or Shenango valley, as a midway point between the lake shore and Pittsburg, determining its value in the pig there, and then deducting the freight into the valley to get the price on Lake Erie dock, which has been the usual basis of sales. The fact that moisture figures as a considerable element in freight cost, accounts for basing the price computations on the dried ore at a furnace intermediate between those on the lake shore and those at Pittsburg.

Taking, now, the base ore at $2.60, the average freight to a valley furnace, presuming that half the consumer's supply went forward direct from vessel and that half was taken from dock stock piles, would be 55 cents, counting 55½ cents net for direct ore and 57½ cents net for stockpile ore. This gives $3.15 as the price in the valley. Divided by 56.70, the iron content of the ore dried at 212 degrees, gives $0.05555 as the unit price of all ores in the list, taking no account of phosphorus. Thus the dock value of an ore running 65 per cent in iron, having six per cent of moisture and the same phosphorus content as the base ore—.045 per cent—would be found by multiplying 61.10 by .05555 and deducting from the product $3.39, the 55-cent average freight, giving $2.84.

The variations in phosphorus introduced another complication; and the result of the work on this part of the problem is the phosphorus table given below, which is a conspicuous feature of the labors of the new association in the direction of a scientific basis of values.

The starting point in the computation of phosphorus values was established at $0.0075, or three quarters cent, and the rates of increase in the price, for lower phosphorus were made to vary by $0.0005, or one-half mill, for a phosphorus variation of .001 per cent. The addition to be made to the price of an ore because of its lower phosphorus will be found by adding together the various increments opposite the phosphorus percentages intervening between the base and the percentage in question, and then adding the increment of the latter. Thus an ore running .042 in phosphorus would be worth, on account of its lower phosphorus, $0.0255, or 2.55 cents, more than the base ore, or the sum of $0.0080, $0.0085 and $0.0090, these being the increments or rates of progression opposite .044, .043 and .042. An ore .070 in phosphorus, the table shows, would be worth 35 cents less than the base ore; an ore .020 in phosphorus, 35 cents more than the base ore, and an ore .005 in phosphorus, 71 cents more than the base ore. Adding together the extremes of the table, there would be a difference of $1.06, based solely on phosphorus, between an ore containing .07 per cent and one containing .005 per cent of that element. The .07 ore is of course beyond the Bessemer limit, but the figure is carried over, apparently, from the preceding season, when Mesabi ores of that constituency, were included in the allotment because they found their way into certain Bessemer mixtures.

PHOSPHORUS TABLE.

Percentage.	Rate of Progression.	Phos. Values.	Percentage.	Rate of Progression.	Phos. Values.
.070	$0.0200	$0.3500	.037	$0.0115	$0.0780
.069	.0195	.3300	.036	.0120	.0900
.068	.0190	.3105	.035	.0125	.1025
.067	.0185	.2915	.034	.0130	.1155
.066	.0180	.2730	.033	.0135	.1290
.065	.0175	.2550	.032	.0140	.1430
.064	.0170	.2375	.031	.0145	.1575
.063	.0165	.2205	.030	.0150	.1725
.062	.0160	.2040	.029	.0155	.1880
.061	.0155	.1880	.028	.0160	.2040
.060	.0150	.1725	.027	.0165	.2205
.059	.0145	.1575	.026	.0170	.2375
.058	.0140	.1430	.025	.0175	.2550
.057	.0135	.1290	.024	.0180	.2730
.056	.0130	.1155	.023	.0185	.2915
.055	.0125	.1025	.022	.0190	.3105
.054	.0120	.0900	.021	.0195	.3300
.053	.0115	.0780	.020	.0200	.3500
.052	.0110	.0665	.019	.0205	.3705
.051	.0105	.0555	.018	.0210	.3915
.050	.0100	.0450	.017	.0215	.4130
.049	.0095	.0350	.016	.0220	.4350
.048	.0090	.0255	.015	.0225	.4575
.047	.0085	.0165	.014	.0230	.4805
.046	.0080	.0080	.013	.0235	.5040
Base .045	.0075	.0075	.012	.0240	.5280
.044	.0080	.0080	.011	.0245	.5525
.043	.0085	.0165	.010	.0250	.5775
.042	.0090	.0255	.009	.0255	.6030
.041	.0095	.0350	.008	.0260	.6290
.040	.0100	.0450	.007	.0265	.6555
.039	.0105	.0555	.006	.0270	.6825
.038	.0110	.0665	.005	.0275	.7100

The figures above and the accompanying data would indicate the utmost painstaking in the preparation of the new Bessemer ore schedule; and the appearance of odd cents and even half cents in a list of ore prices is another index to the new era, in which cost is figured, not in dollars, nor even in fractions of dollars, but down to the ultimate cent.

Recent Ohio Steel Co. Records.

Though the present is a particularly unfavorable time for continuously large outputs, owing to the interruptions of mill operations, there have been several conspicuous turn records by steel works. Mention was made recently of the production of 864 tons of ingots in one 12-hour turn at the Ohio Steel Co.'s plant at Youngstown. The largest tonnage in 24 hours in the same month (March) was 1,618 gross tons. In 48 turns in the month of March this plant made 29,305 tons of ingots. While this was not remarkable in itself, it indicates more regular operation than might be expected under existing conditions, which make it difficult to secure orders so suited to a mill as to permit of a maximum output. While the reported capacity of the Youngstown plant is 360,000 tons of rolled steel a year, it is evident that this will be far exceeded under favorable circumstances. In one hour, 80 tons of steel have been rolled, which would give a rate of 1,920 tons in 24 hours.

NO ARMOR PLATE LETTING.

No bids were made by the Carnegie Steel Co., Ltd., and the Bethlehem Iron Co. on the 8,000 tons of armor plate for the three battleships now under contract. At the opening of bids last Thursday, a communication was received from the Illinois Steel Co. offering to furnish the 8,000 tons of armor plate now needed for $300 per ton on condition that Congress shall award a contract to it for the entire wants of the United States Government for 20 years to come, at an average price of $240. The second proposition is to lease ground to the Government at a nominal rental, provided a plant for the manufacture of armor plate be erected thereon, the steel company to furnish ingots to the Navy Department at a stipulated price of $22.50 per ton.

W. P. Palmer, representing the Illinois Steel Co., was present at the opening of the bids. Mr. Palmer said that his company did not have a complete plant for the manufacture of armor plate, but did have the blast furnaces, and the open-hearth department would form a large portion of the equipment necessary for the manufacture of armor plate.

In explaining his bid, Mr. Palmer said: "Our first proposition contemplates furnishing the required quantity of nickel steel armor plate and appurtenances for battleships Nos. 7, 8 and 9 at $300 per ton on board cars at our South Chicago works. This proposal is made conditional upon Congress awarding us a contract for 20 years from date at an average price of $240 per ton, the total tonnage of armor plate ordered for this period to be not less than 6,000 nor more than 12,000 tons in any one year. Should we be unable to furnish the minimum quantity of armor plate in any one year we agree to pay $100 per ton as liquidated damages for such quantity as we may be in default. Should the Government not require the minimum quantity in any one year we would exact the payment of $100 per ton as liquidated damages for the difference between the amount ordered and the minimum. Should a contract be awarded us we will rebate to the Government $40 per ton on the 8,000 tons of armor plate for battleships Nos. 7, 8, and 9. We will furthermore without delay undertake the construction and completion of a modern armor plant and commence deliveries within 18 months of the date the contract is awarded us and furnish armor plate at the minimum rate of 500 tons per month until 8,000 tons have been delivered to the Government. We understand the Govemnment has the right to the use of the Harveyizing process, and we would not be liable for the payment of royalty. For the faithful performance of the work in accordance with this offer we are prepared to furnish bonds for $1,000,000."

The alternative proposition requires the Govemnment to erect within two years on land leased for the nominal rent of $1 per year a plant for the manufacture of armor plate of a minimum capacity of 500 tons per month and the purchase from the Illinois Steel Co. of such acid or basic open-hearth steel as the plant may require. With the most modern open-hearth plant that has yet been constructed, the steel company declares its ability to cast ingots of 100 tons weight and with moderate expenditure on 30 days' notice to cast and handle ingots weighing 150 tons each. These steel ingots are to be supplied at $22.50 per ton on the gross weight of the ingot, with a credit of $8 per ton for the scrap. This price is for plain steel, the Government being compelled to supply the nickel.

The letter of the Carnegie Steel Co. said in part: We trust you will be able to satisfy Congress of the importance of such legislation as will enable you to negotiate with armor manufactures to secure at a far price the quality of armor the Government should have. If you are in a position now to negotiate with us and we could not agree upon the price we would be perfectly willing to have the price fixed by arbitraton the arbitrators to be skilled men in the art."

In a long communication, the Bethlehem Iron Co said: "In protection to our own interest we can not afford to operate our plant to produce the steel required by the Government at prices less than those now ranging. We are willing to sell our plant to the Government below cost at a price to be fixed by arbitration. If the limitation fixed by Congress is removed we do not doubt we can agree with the Navy department upon a fair and equitable price."

Since he has no authority to make a contract with the Illinois Steel Co. on the basis proposed in its bid, Secretary of the Navy Long has asked Congress for instructions in the dilemma in which the department finds itself. He recommends that the depatrment be given power to advertise for new bids and at a price not exceeding $400 a ton. In the House, Mr. Hopkins, of Illinois, objected to the reading of the communication of the Secretary and unless Speaker Reed appoints a new committee on naval affairs it is said the question cannot come up at all in the special session. The belief of the Secretary of the Navy evidently is that with the limit raised from $300 to $400, the Bethlehem Iron Co. and the Carnegie Steel Co. can be induced to bid.

Personal.

Julian Kennedy, the Pittsburg consulting engineer, sailed for Russia last week on business connected with the new plant at Mariopol, of which he is consulting engineer.

Henry M. Howe, the well known authority on the metallurgy of steel, for some time a professor in the Massachusetts Institute of Technology, has been chosen professor of Metallurgy in the School of Mines of Columbia University.

Wm. G. Pollock, of J. H. Outhwaite & Co., Cleveland, sales manager for the well known Lake Angeline mine and for the Volunteer, has returned from a European trip.

Hon. Henry Clay Evans, of Chattanooga, Tenn., who has been appointed United States Commissioner of Pensions, is manager of the Chattanooga Car & Foundry Co.'s works, and largely interested in public enterprises. He has been in Congress and was First Assistant Postmaster-General during President Harrison's administration. Mr. Evans is vice-president, for the Southern States, of the American Foundrymen's Association.

At the last meeting of the board of government of the Technical Club of Chicago, the resignation of H. F. J. Porter as treasurer of the club was presented and adopted, and Jas. F. Lewis was elected to fill the vacancy. Mr. Porter expects to be away from Chicago the greater part of the time for several months to come, and therefore felt that he would be unable to attend to the club's business. In the absence of Vice-president Davenport in Europe, Mr. Porter will spend considerable time at South Bethlehem.

The marriage of Second Vice-president and Treasurer L. C. Phipps, of the Carnegie Steel Co., Ltd., to Miss Genevieve W. Chandler, will occur on the 22nd inst., at Charleroi, Pa.

Frank L. Clark, of William Clarks' Son & Co., Pittsburg, and Edward H. Utley, of the Carnegie Steel Co., Ltd., sailed for Europe last Saturday.

National Foundrymen's Convention.

The committee having in charge the making of arrangements for the entertainment of the American Foundrymen's Association in Detroit, May 10, 11, 12, 13 and 14 has received information concerning the number that would like to be in attendance that it is making preparations to entertain 800 foundrymen.

The committee, consisting of W. H. Pfahler, of the Abram Cox Stove Co., Philadelphia; Wm. Yagle of Wm. Yagle & Co., Pittsburg, and E. H. Putnam, of the Chattanooga Plow Co., Chattanooga, Tenn., appointed to consider the advisability of organizing a defense association in connection with the American Foundrymen's Association, met in Detroit, Monday and Tuesday, April 5 and 6, and after discussing the matter at length, prepared a report to be submitted to the convention, together with some recommendations as to the best plan to be adopted, if it is the decision of those present that such an organization should be founded. The committee was unanimous in the opinion that such an organization would be of much benefit, and that it contained more possibilities of good than any other proposition that could be submitted to foundrymen at this time. The report which the committee will submit will deal with the matter in detail. Mr. Pfahler has had many years experience in matters of this kind as a member of the Stove Founders' Defense Association, and his explanation of the workings of that society and the good accomplished had much to do with the committee's decision.

THE Iron and Steel Sheet Manufacturers' Association met in regular session on Tuesday, April 13, at their headquarters in the Conestoga bldg., Pittsburg. Routine business was transacted.

FIRST IN OHIO TO USE LAKE ORES.

There has been not a little controversy over the date of the first use of Lake Superior ores in the blast furnace. Mr. Swank's "Iron in All Ages" quotes the statement of the late A. L. Crawford, of New Castle, Pa., that he received in 1850 about ten tons of Jackson ore, which had been hauled around the falls of Sault Ste. Marie on a strap railroad one and a quarter miles long. He adds that in 1853 a few tons of Jackson ore were shipped to the World's Fair at New York. In 1853, it is stated on the authority of the late David Agnew, of Sharpsville, Pa., the Sharon Iron Co. brought at great expense to Erie, about 70 tons of Jackson ore, shipping it to Sharpsville furnace. In 1854, 1855 and 1856, Clay furnace, nine miles west of Mercer, Pa., used Lake Superior ore mixed with native ore, using in all up to August, 1856, about 400 tons.

The first shipment of Lake Superior ore into the Mahoning valley was made by the Cleveland Iron Mining Co., next in age to the Jackson Mining Co. This was in 1856. Some inquiries recently made by Mr. J. H. Sheadle, secretary of the Cleveland-Cliffs Iron Co., successor to the Cleveland Iron Mining Co., have brought out some of the particulars of this first use of Lake Superior ores in Ohio. It is established that the first shipment of Cleveland ore was made in the steamer

CHARLES T. HOWARD.

Ontonagon, in 1856, and consisted of 269 tons. The steamer left Marquette June 18 of that year and arrived at Cleveland June 24. The first shipment of this ore to the Mahoning valley was made in 1857 and Charles T. Howard was the purchaser. The officers of the Cleveland Iron Mining Co., with whom Mr. Howard made his contract, were Samuel L. Mather, H. B. Tuttle, W. J. Gordon and Dr. Hewitt. Mr. Howard is now living at Jamestown, Pa., and is 76 years old. Among other correspondence Mr. Sheadle has the following letter from Mr. Howard, which gives interesting details concerning the particular matter under inquiry, and as well concerning the status of iron making in Northeastern Ohio at that early day:

"DEAR SIR: As you are located in Cleveland and in the mining business and familiar with the state of affairs at the extensive iron works of the city, I thought it would not be uninteresting to you to give you a short sketch of how things in that line stood 50 years ago.

"My own experience in that line reaches back to 1842, and there are but few now living who were actively engaged in the business at that time. I began work as a laborer at the Etna furnace in Akron, O., in the spring of that year. But little was done in the way of iron-making in Northern Ohio then. There was one furnace in the vicinity of Painesville and one at Niles, O., known as the Musketo Creek Furnace, and I believe the owner of it was the late Wm. McKinley, Sr., the father of President McKinley.

"The iron business might be said to have been in its infancy at that date. The Etna furnace, where I was at work, was a square stack, built of stone, 30 feet high, nine feet bosh, with only one tuyere arch on one of its four sides, therefore only one tuyere or one place for the blast to enter. The stack stood on one side of the Ohio canal, and the blowing machinery, consisting of one small wind cylinder, driven by an over-shot water wheel, on the other side. The wind was carried over a bridge to the furnace through a pipe made of leather, on the end of which was a sheet iron nozzle which was inserted into the stack. When the tuyere needed snuffing, the keeper took hold of the leather pipe, pulled out the nozzle and let the wind blow into the air while he was removing the obstacles.

"Bog ore was used, being easier melted. Charcoal was the fuel and no limestone was used. There was no dam plate. The slag did not run off as it does now. When the cinder or slag came up to the tuyere it was pulled out with a long bar of iron with a flat quash hook on the end of it. The bottom of the hearth was some 18 inches underground. When the iron began to show, casting was accomplished by digging a small ditch from the pig-bed to the bottom of the hearth; and when the iron was all out, filling up again. If you would tell a furnaceman of the present day this, he would not believe you, but it was the way then.

"The Etna Furnace was owned by a company and the business carried on in the name of the Akron Mfg. Co. The principle owners were James R. Ford, Arad Kent, Simon Perkins and Daniel Tod, of Brier Hill. The Akron Mfg. Co. did nearly all the business of the village at that time. They had the blast furnace and a foundry that used up nearly all the metal made, a machine shop, lumber yard, plow shop, lime kiln, stores, etc., etc., and in doing all this business gold, silver and bank notes were seldom visible. Everything was paid for by orders.

"There was no bank then. I suppose the reason was there was no cash to be deposited in a bank. The Akron Mfg. Co. was always ready to give an order for anything wanted and in existence anywhere in Akron or its vicinity, but to ask for cash was useless.

"The Akron Mfg. Co. went out of business in 1848, and about the same time James Ward, of Pittsburg, built the Brier Hill furnace and I got employment with him, first as clerk, in a short time as manager, and later as founder and manager. The Philpot furnace was erected about the same time, and also the Lowell furnace. These three were all built to use stone coal in the raw state. The Brier Hill furnace was the most successful. The four years that I had charge there was no stoppage of any account. Capt. Wood had a rolling mill at Pittsburg and used up his own pig iron there. The other two having to depend upon the market, did not run anything like full time. It was at the Brier Hill that the use of the gas from the stack for steam power and heating the blast was first used, and it was the most successful furnace in using this improvement. [Mr. J. J. Spearman, of Sharpsville, Pa., is authority for the statement that Lowell furnace was first to bring gas down.—Ed.]

Capt. Wood had a contract with Tod & Ford for coal for ten years at $1.03 per ton delivered at the furnace, which was low indeed; but the Brier Hill coal was a new thing at that time. Very little had been mined, but later on when the steamers on the lakes got to using Brier Hill the price advanced considerably.

"In 1847 or 1848 a company of Welshmen built a furnace in Summit county, O., not far from a place known as the Old Forge, near Akron, O., and expected to get the coal from a mine that was being worked a little near Tallmadge, five miles from Akron. They put up a good stack and good machinery, but after several trials found out that the Tallmadge coal would not do for smelting, so they quit, gave up the whole thing as a failure, leaving machinery and everything standing there. I bought the whole thing for a small sum, took it down and moved it to Youngstown, built the Falcon furnace and used the Welshmen's machinery and everything else I could use. I had saved up $700 from my salary with Capt. Wood, and I thought I was rich enough to be an iron master on my own account. I found out later on, that $700 was not anything like enough money to build and run a blast furnace; so after running one year I sold out to James Wood & Co., of Niles, O., went to Massillon, O., and built the first Massillon furnace

for Marshall Wellman, who was president of the Massillon Bank.

"In 1854, returned to Youngstown and built the Phoenix furnace in company with Lem. Crawford, of Cleveland. The firm was Crawford & Howard, and everything went along smoothly and would have continued so, but Mr. Crawford had a son that represented him at the furnace. I could not get along with him, so I sold my interest to Mr. Crawford and bought back the Falcon from Hurd & Co. I rebuilt the stack and made improvements of different kinds; but the iron made from the lean ores about Youngstown was not just what was altogether suitable for the Pittsburg rolling mills in making iron and nails. That being the principal market, ore that would mix with the native ore and improve the quality of the pig iron was much desired and sought for. So, in 1857, when I saw a notice in the Cleveland *Herald* that the Cleveland Iron Mining Co. had received a cargo of Lake Superior ore, and was prepared to supply blast furnaces and rolling mills on reasonable terms, I made a trip to Cleveland in order to see the ore and get some idea of what it would yield, and what it would cost delivered in Youngstown. I met with the president and with Mr. Tuttle, who was secretary, and found them to be anxious to have the furnaces commence the use of their ore. They said they were prepared to furnish a steady supply, so I made arrangements with them to send me a few carloads at once. Let me say that the idea prevailed at that time amongst the furnace men that Lake Superior ore could not be smelted with raw coal; that the ore would have to be roasted first and the coal made into coke before using. But there was nothing of this necessary. It worked nicely from the start, improving the quality of the iron by giving it body, and very much increasing the output of the furnace per day and making the cost per ton for labor less, and the iron more salable as well.

"And from year to year, in watching the advance in the manufacture of iron in Northern Ohio and how much it has added to the building up of the Lake City, all this growth being in a great measure owing to Lake Superior ore, it is pleasant to look back to the day the first cast was made from it at the Falcon furnace in Youngstown, and to know that it has continued in use through all these years."

Received from the Trade.

In its 1897 catalogue, the Springfield Machine Tool Co., Springfield, O., gives half-tone and line engravings of its chief specialties—engine lathes, crank shapers and power presses—prominence being given to the Springfield Muller engine lathes and the Springfield shapers. The geographical position of this company and its proximity to important manufacturing centers, giving it advantages in shipping, have been one important element in the building up of its trade. The catalogue before us has a new feature in presenting under special tables with each size of machine, comprehensive data on dimensions, shipping weights, net and boxed—for foreign shipment, etc.

"Handbook of Gearing," in stiff cloth-faced covers, has been issued by Taylor, Wilson & Co., Ltd., of Allegheny, Pa. The manufacturers say that for some time they have been making gear wheels on the Groves patent molding machines; that in their practice the epicycloidal tooth contour has been made the standard; and that special irons are employed, graded to suit the varying magnitude of the castings. The bulk of the pamphlet is given up to tables, containing computations of diameter, pitch, face, number of teeth, etc.

P. F. Olds & Son, Lansing, Mich., in a recent catalogue illustrate their gas and gasoline engines and give details of construction and adaptations to particular service.

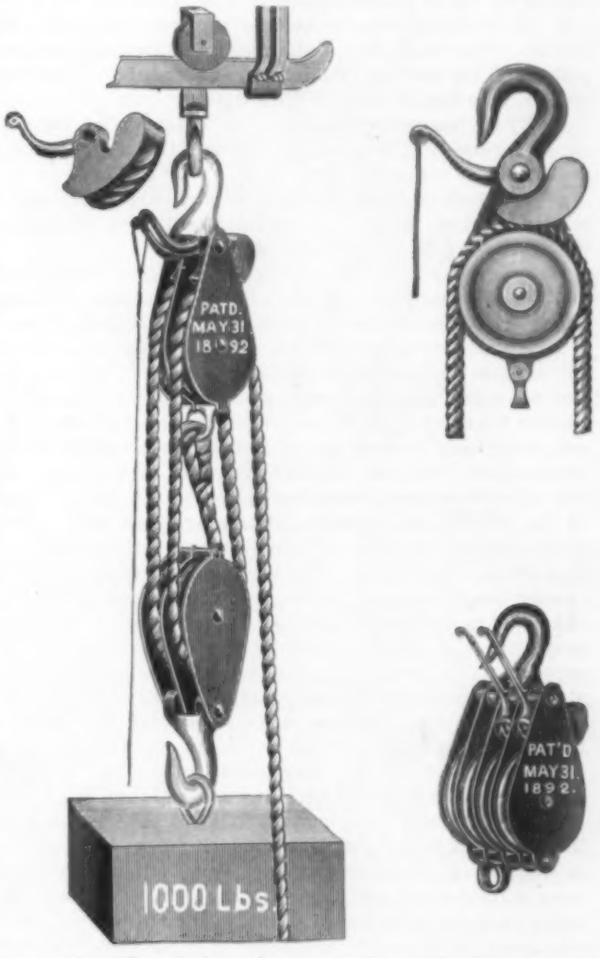
A. & P. Roberts Co. will establish on April 15 a branch office of the Pencoyd Iron Works in the American Surety Bldg., New York. The selling arrangement heretofore held with W. N. Wallace & Co. has been discontinued.

At the Protection mine on the Menominee range, the Appleton Land & Iron Co., in its diamond drill work, has gone through 21 feet of ore at a depth of 150 feet.

The Troy Steel Co.'s plant at Troy, N. Y., resumed Monday, April 12.

AMERICAN SAFETY TACKLE BLOCK.

The illustrations indicate the special features of the American safety tackle block of the Detroit Sprocket Chain Co., Ltd. This company manufacturers sprocket wheels, malleable iron buckets and elevating and conveyihg appliances. As a guarantee of strength and finish only the best steel and refined malleable iron are used in the construction of this tackle block. The lock is a single piece and drops of its own weight on the rope over the sheave. Having the cam or eccentric movement, the heavier the load the tighter it is locked. Two eccentrics are on each block, one over each sheave. They act independently of each other and therein is safety made doubly



sure. Six different sizes of rope can be used with any one size of block. A point emphasized by the manufacturers is the instantaneous locking of the block, so that cutting and extra wear on the rope and wheels are saved.

The wage trouble at the Cleveland plant of the Consolidated Steel & Wire Co. has gone to the United States Court, Judge Geo. R. Sage having granted a temporary injunction restraining the strikers from interfering with any of the officers or employes of the company. The strikers are also restrained from soliciting the non-union employes of the company to join lodges of the rod mill workers or to accost those who are working, to induce them to quit the employ of the company. The hearing on the injunction is fixed for April 22. The trouble was about at an end when the injunction was secured. At a conference Saturday night the company had agreed to pay the Cleveland rod mill scale and to waive certain changes in the heating schedule. It was stipulated that the men recede from the position they had taken, that all the old men be reinstated. On Sunday the men failed to ratify this basis of settlement. However, on Monday, while the injunction was issuing, the strikers' meeting decided to accept it, but Supt. Baackes told President Kane, of the rod mill workers' union, that it was too late, the power to negotiate further having been taken out of his hands by the general offices. The strikers say that the order of the court will be obeyed. At the works the rod mill is being operated by non-union men, but not with a full force.

LARGE AND SMALL ROLLS.

A writer in *Tin and Terne* discusses the relative efficiency of large and small rolls. He first lays down five general propositions as to the action of the rolls upon the metal, and then considers the problem presented by varying diameters of rolls:

1. There should be such relative proportion between the thickness of the bar or pack and the diameter of the rolls as to preclude any slip of the rolls on the arcs of contact—such slip is abnormal and means much unnecessary loss of power.

2. The friction between the rolls and the bar on the line of the arcs of contact must be sufficient to overcome the resistance of the bar or pack to tension or elongation.

3. In breaking down of the bar the order of action is as follows: First, the motion of the rolls, then frictional contact, pulling of the bar into the rolls, next pressure is created on the bar, then flow of metal or draw follows.

4. By far the greater portion of the reduction of the bar occurs between the outer or right limbs of the arcs of contact in rolls of any diameter.

5. The bulk of the hardening or condensation of the metal occurs between the inner or left limbs of the arcs of contact; this is true of rolls of any diameter.

What are the relative merits of a large roll over a small one, and will a large roll consume more power than a small one doing the same amount of work under suitable conditions? It is claimed that experience has demonstrated that a larger roll requires more power to do the same work. This conclusion has been based on a wrong interpretation of the conditions in the cases of large and small rolls respectively. We are constrained to deny the truth of the conclusion of the experimentalist that the lengthened radius of the larger roll acts at a disadvantage mechanically over the shorter radius of the smaller roll, thereby consuming more power for a given amount of work. While it is true that the large roll does act in this sense to a disadvantage, this disadvantage is exactly counterbalanced by the slower movement of the arcs of contact toward each other, which movement is inversely proportional to the lengthened radius of the large roll, presupposing that both rolls have the same surface speed. To attempt to solve this problem by simply inserting a larger roll in the same train without a corresponding and suitable change in the balance wheel and in the speed of the engine would be absurd from the very fact of an increased diameter of roll giving an increased surface speed and therefore a competency to a proportional increase in the output or work done. To compare a 24-inch roll with a 48-inch roll, as is done in the accompanying diagrams, requires that both be run at the same surface speed, and hence that the 48-inch roll make only half as many revolutions per minute as the 24-inch roll. With no change in the engine or manner of connection, this would necessitate that the engine be run at half the speed with the 48-inch roll, and hence it only develops half as much power. This point is generally overlooked, and hence the claim that the larger roll requires more power. There is, however, another factor. The arc of contact is longer with the 48-inch roll than with the 24-inch, although both are effecting the same reduction. This indicates greater pressure on the necks of the rolls, and hence an increase in friction at those points. But the arc is not longer in proportion to the increased diameter of the roll. While the 48-inch roll is twice the diameter of the 24-inch, the arc of contact is only 1.4 that in the 24-inch. It is obviously a fact that the larger roll has the advantage in the increased bite, thus avoiding slip, owing to the slighter curvature of its arcs of contact, while at the same time, in rolling a pack, there is more likelihood of all the sheets in the pack being drawn out the same amount with the large roll than with the small one.

In a larger roll, owing to the lessened curvature of the arc of contact, there is not the same freedom of escape for the metal undergoing pressure, but on the other hand there is an increased tendency to condensation and hardening of the metal, and of course it will flow with less freedom, and this tendency increases with the size of the rolls. In rolls infinitely large the arcs of contact would become straight parallel lines and drawing action would disappear, on account of the infinite friction, and the entire tendency would be to condensation. On the other hand, with rolls infinitely small, we have theoretically simply a mathematical line without measurable diameter. In this case there would be neither draw nor condensation; it would be all bite, merely acting as a cutting edge. Now, as these two suppositions are diametrically opposed in their theoretical effect, the problem calling for solution is where to draw the line, or what diameter of roll will prove most efficient or give the best practical result. If too small there is liability to breakage from pressure and too great heating, together with loss of power by slip and irregular drawing of the different sheets in the pack.

Obituary.

Fred Heron, who was general manager of the Universal Construction Co., of Chicago, until April 1, when he retired, died at his home in Chicago, April 5. Mr. Heron was an Englishman by birth, and came to this country about 18 years ago, becoming connected with the drafting department of the Philadelphia & Reading Coal & Iron Co. He was with this company for several years, and later became master mechanic of the Homestead plant of the Carnegie Steel Co., which position he held for a number of years. Mr. Heron constructed the plant of the Bellaire Steel Co., and the steel plant of the Phoenix Iron Co., of Phoenixville, Pa. For five years he was general manager of the latter company. Upon the formation of the Universal Construction Co., of Chicago, a year ago, he became its general manager. Mr. Heron leaves a wife and four children.

THE assignment of the Brilliant Tube & Iron Works, of Brilliant., O., which was hastily made last fall, was set aside on Monday by Judge Mansfield, at Steubenville. The assignment was opposed by Joseph Speidel, George K. Wheat and other Wheeling stockholders and the contention was carried into the courts, where Henry M. Priest was named as receiver. Assignee McMasters, however, refused to give up possession of the works, and the present suit resulted. The court now holds that the deed of assignment which was made without a meeting of the board of directors, is void. By consent of the plaintiffs, the receiver, H. M. Priest, is ordered to pay out of the proceeds of the property $466.95 due to watchmen and laborers employed by Assignee McMasters. All other claims of the assignee, including his attorney fees and personal compensation, were refused. The assignee gave notice of an appeal. The receiver had already filed a petition and had been granted permission to sell the property but could not secure control of the plant.

Operations at the rail mill of the Edgar Thomson Steel Works were resumed last Friday. The fly-wheel at the 33-inch mill of the Homestead Steel Works was transferred to Braddock for service in the rail mill. The 33-inch mill at Homestead is running on half speed, the remaining engine being able to drive the rolls at this considerably reduced rate. Half of the new wheel was cast last week by the Southwark Foundry & Machine Co., of Philadelphia, and the other casting will be made this week, so that the wheel will be replaced in a short time. Both rail mills at Edgar Thomson are now in operation on double turn.

THE incorporation of the Stephenson Mining Co. under the laws of Michigan has led to exaggerated reports concerning the purpose and extent of the new company. Its capital is $10,000, and not $100,000 as telegraphed. The directors are A. M. Robbins, Cleveland; H. A. J. Upham, Milwaukee; Ex-Congressman Stephenson, of Marinette, Mich.; R. C. Flanagan, Norway, Mich.; and James McNaughton, of Iron Mountain. In connection with the acquisition of control in the Hamilton and Ludington mines, the Chapin Mining Co. also secured a controlling interest in the old Stephenson mine at Norway, Mich. The latter mine being under lease to the Penn Iron Mining Co., could not be included in the consolidation and therefore a new company was organized to hold the fee of the mine.

THE Braddock plant of the Consolidated Steel & Wire Co. and the plant of the Pittsburg Wire Co. are operating on both turns and on Saturday nights and Sundays in order to fill orders.

DOUBLE-ACTING PLANER HEAD.

Jos. A. Costello, of 179 Luther st., Cleveland, has devised a planer tool holder that differs from other inventions looking to the utilization of the return stroke of the planer, in that it makes use of a single tool with a double cutting edge. A number of heads have been devised employing two tools, but they were capable of operation only on plain work.

The apron frame A shown in the cuts is attached to the cross-rail in the usual way. The tool-bearing apron B has

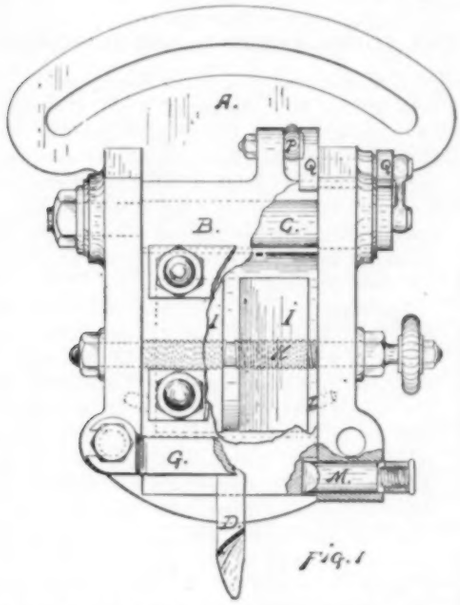


FIG. 1

its rearward side beveled to conform to the forward faces of the wedges II (Fig. 4). Thus when the apron and attached tool are swung into their rearward position the apron conforms to the bearing surface afforded by the forward side of the wedges. The normal position of the tool is vertical. From this it swings backward for the forward cut. It is returned to the vertical position at the end of each stroke by means of the pin M (Fig. 4), which is forced outward during the cutting operation.

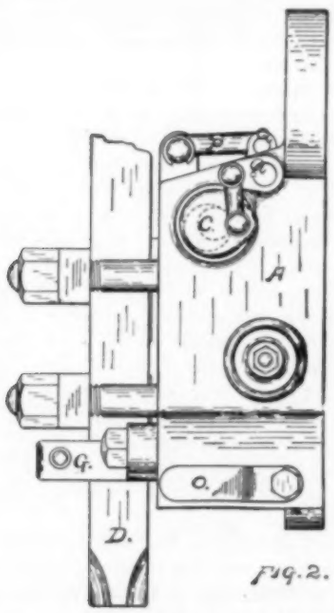


FIG. 2.

The wedges II are instrumental in limiting the rearward swinging movement of the apron B and attached tool. They are connected by a right and left hand threaded screw K and are moved towards or from each other according as the screw is turned, by which operation clearance is given to the tool when in its rearward cutting position. The wedges also serve to correct any imperfection in the grinding of the tool, which is of the double cutting edge variety.

A plate X (Fig. 3) forms a rear bearing for the tool, and is used to set its cutting edges at the same elevation relative to the work. The stop G limits the forward swinging movement of the apron and attached tool. H is a wedge suitably arranged in the stop to relieve the strain on the tool-clamping studs.

The spring O actuates the pin inwardly and returns the apron and tool into their vertical or normal position, preparatory to the engagement of the tool by the work, when the tool is not in operation.

C is an eccentric shaft upon which the apron B swings, and

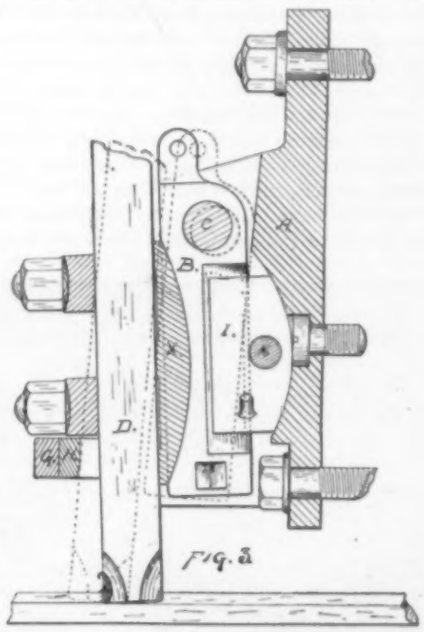


FIG. 3.

it is also connected by levers P and Q to the upper end of the apron. It serves to retain either one of the tool's cutting edges, during its actuation into its operative position, at the same elevation at which it is held in the perpendicular or normal position. This enables the attendant to reverse the work at any point between the ends of the stroke without altering the depth of cut or mutilating the work. It will be seen that if the shaft C were a plain shaft, the forward cutting edge would be lowered during the rearward swinging movement of the tool-bearing apron, and the rearward cutting edge would be elevated during the forward swinging movement. All this is overcome.

The angular pins LL are arranged to preserve a parallelism between the forward sides of the wedges II and the rearward side of the apron B during any adjustment of the wedges.

This head can be converted from a double-acting to a single-acting head by disengaging the forward end of the lever P from the apron B; drawing the wedges II tight together by means of the screw K, thereby forming a solid backing for

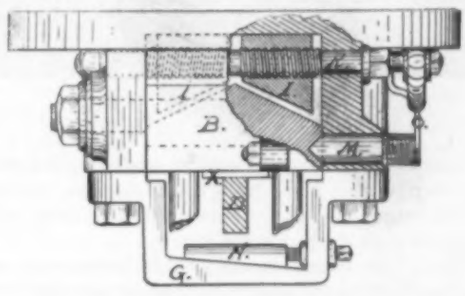


FIG. 4.

apron B, which also brings the apron into a perpendicular position; removing the stop G by slightly loosening the nuts which secure it; then disengaging the pin M.

With the addition of an extra feed and a speed reducer, the head can be operated on planers now in use, and it is built with a view to replacing old heads on any planer. Its capacity for being operated on all classes of work and its adaptation to the planing of the side of a piece of work as readily as the top and to complex work as well as plain, are features that will commend themselves.

SAND CONVEYOR FOR FOUNDRIES.

The handling of sand in foundries and in various other industries is a subject of much concern, owing to the destructive effects of the material, in its contacts with the metal parts of apparatus designed to convey it. These effects are especially to be guarded against in conveyors which are required to discharge their contents at different points. A conveyor having a minimum number of parts, with all bearings and working joints entirely removed from contact with the sand, would naturally appeal to a man whose experience had familiarized him with the difficulties to be overcome.

The reciprocating sand conveyor which we illustrate has been designed to fill the requirements named. Its construction is simple, consisting of a main bar from which is suspended by means of U bolts malleable iron flight frames. To these, steel flights are attached by means of harness leather hinges. The main bar is supported by arch bars spaced 20 feet apart, the arch bar operating on a stationary flange wheel.

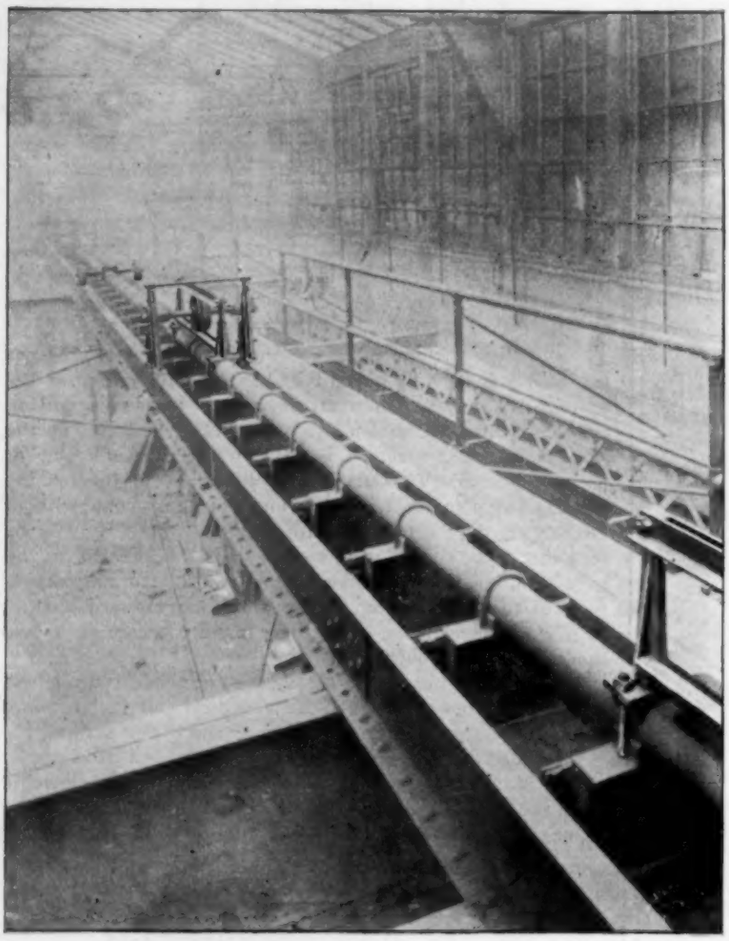


FIG. 1.—SAND CONVEYOR FOR FOUNDRIES—LONGITUDINAL VIEW OF 230-FT. CONVEYOR OF WESTINGHOUSE AIR BRAKE CO., WILMERDING, PA.

The power is applied usually at the head end by means of crank and pitman. The sand is not allowed to rise over two-thirds the height of flight and consequently does not cause any deterioration in the leather hinge.

A feeding bar and pan can be used in connection with the conveyor, affording convenient means of regulating the amount of material passing to it. This feeding bar when used is attached to and operated by the main conveyor bar. The design of the conveyor is such that the material may be deposited at any number of intermediate points. In operation the conveyor is noiseless.

Heyl & Patterson, of Pittsburg, are the patentees and manufacturers. The accompanying cuts are from photographs of conveyors erected by them six months ago for the Westinghouse Air Brake Co., Wilmerding, Pa. There are three of these conveyors in this foundry, each 230 feet long, and each handles 40 tons of sand an hour. Heyl & Patterson also installed for the Chambers Glass Co., at New Kensington, Pa., some two years ago, one of these conveyors for handling white sand used in making glass. This sand is exceptionally sharp. The conveyor has been in constant operation and with very satisfactory results. The Heyl & Patterson system of coal and ash conveying, as exemplified at the great power plant of the Johnson Co.'s steel works, at Lorain, O., has already been described in these columns, and has had attention from engineering and metallurgical journals on the other side of the water. The company has been quite successful in the development of economical conveying machinery, new adaptations being worked out as new problems present themselves.

THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on Wednesday evening, April 7, President Wanner in the chair. Before taking up the regular business of the evening, Secretary Evans announced the death of Godfrey Rebmann, head of the firm of G. Rebmann & Co. Mr. Rebmann contracted a cold in attending the funeral of a brother foundryman. It developed into pneumonia and resulted in his own death a week later.

The report of the executive committee was read by Mr. Evans as follows: "Your committee would report that we have just received an invitation from the American Foundrymen's Association to attend the second convention to be held in Detroit, Mich., May 10, 11, 12, 13 and 14. Mr. John Fenton, who is secretary of that association, is making every effort to make the convention a success. Our members will no doubt remember that the first convention was held in Philadelphia, in May of last year, and we were told by one and all of the visitors that it paid them well for the time and money spent. The coming convention gives those having it in charge an opportunity to profit by the experience gained at the last convention, and we have no doubt they will make it more attractive to the delegates. We have no doubt that these conventions are bringing foundrymen to a better understanding and they are learning the value of associations.

"The new Pittsburg Association has been formed since the Philadelphia convention, and in a report of their last meeting we notice they had an attendance of about 80 foundrymen, and elected 23 new members, so that it would seem that foundrymen's associations have come to stay and that they are doing good work. Your committee would suggest that we start immediately to get the names of all of our members and other foundrymen in this section of the country who would like to attend the convention at Detroit, in order that arrangements for low rates can be made. Our former president, Mr. Francis Schumann, who is now the president of the American Foundrymen's Association, will attend the convention, and it is our wish that he shall have a strong bodyguard to represent the foundrymen of this section, which is the birth-place of foundrymen's associations of this country, and no one has worked harder for their establishment than Mr. Schumann. The secretary of this association will be pleased to take the names of persons desirous of going to the convention, or to give any information regarding it."

Mr. Evans asked for reports from those present as to the state of trade.

Mr. Rowland, of Drifton, Pa., said foundries in his neighborhood were doing well, but nothing to brag of.

Mr. Betz, of Wilmington, Del.—"We are getting more work but prices are not much better."

Mr. Messick, of Wilmington, was introduced as having recently traveled in South America. "The foundry business," said he, "does not appear to be very popular in South America. The country seems to be in a very primitive state. I only saw one foundry in my journeys there, and that was a brass foundry. In Maracaibo, Venezuela, where I was, coffee seems to be the staple commercial product, and six merchants in that town of 40,000 population, control the entire business."

Mr. Newbold, of Norristown.—"Business is not much improved up our way, and prices are very low."

Mr. Moore, of Elizabethport.—"We do not feel at all encouraged. Business is not as good now as it was during the winter. We are not employing as many men as we did a month ago."

Mr. Ellicott, Southwark Foundry & Machine Co., Philadelphia.—"Two months ago we were working only five days a week, and with very few men at that. But now we are improving. In fact we are busy and working full time. We are building several large engines. Within a few days we booked an order from Russia for two vertical compound engines. There is a prospect of more to come from the same country.'

Mr. Glover, of Frankford.—"We are full of work, but prices are low. We were making boiler heads at one and a half cents per pound, until a fellow up the country somewhere bid one and a quarter cents, and took the work away from us."

Mr. Stirling, of Harlan & Hollingsworth Co., Wilmington.—"There is not much change in our business, although there is a better outlook in the ship department."

Ex-President Schumann.—"We are reasonably satisfied. Prices are improving. We manage to make a margin of profit by confining ourselves to difficult work. This sort of work will be subject to the close inspection of cranky individuals, but we allow for that in our contracts. Our force of men has dropped from 450 to 350, and we are adjusting ourselves to diminished hours of labor. I am satisfied that the country has ceased to grow as it did from 1870 to 1880. I believe that the expansion of our industry has grown out of the demoralization following the late war, and the rapid growth in population up to 1883. I think it will be necessary for us to cut down expenses and prepare to do a diminished quantity of business."

Mr. Evans, in introducing President Wanner, expressed the opinion that the cast iron pipe trade was always first to feel a return of prosperity. "It is my experience," said Mr. Wanner, "that the cast iron pipe trade comes later in its prosperity

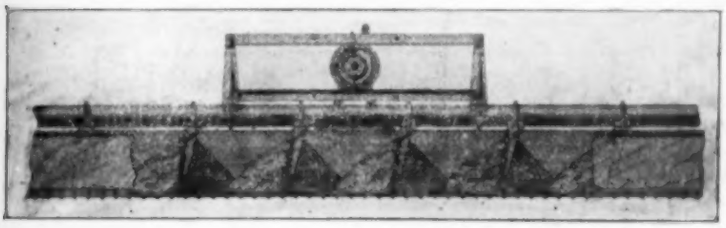


FIG. 2.—SAND CONVEYOR FOR FOUNDRIES—LONGITUDINAL SECTIONAL VIEW.

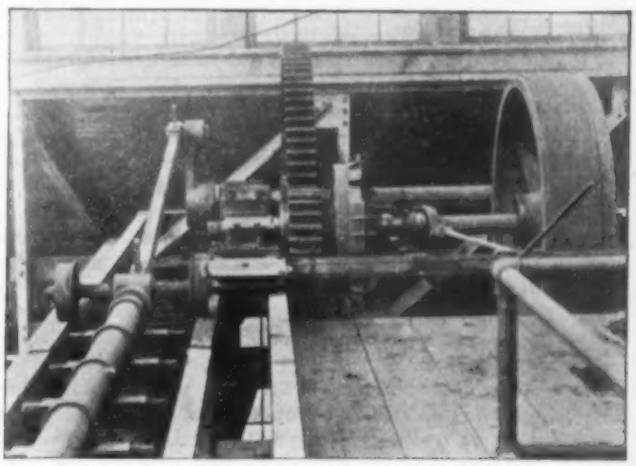


FIG. 3.—SAND CONVEYOR FOR FOUNDRIES.—VIEW OF DRIVING GEAR.

than the other branches of the industry. I predicted the present condition of the pipe trade and others in a paper which I read on May 11, 1892, before the Reading Board of Trade." Mr. Wanner read a few extracts from the paper. He then devoted himself to a general review of the foundry trade in the South. "A few days ago," he continued, "a Cincinnati firm were the lowest bidders for some pipe to be delivered in Brooklyn. I do not know whether they were awarded the contract. But they should not have been. We cannot afford to permit any particular part of the country to do the manufacturing for any other part that has equal facilities. I believe we are on the eve of a revival," he said in conclusion, "but don't be too sanguine. I do not think the profits will be as handsome as they were after the panic of the '70's. The settlement of the tariff question will do wonders and it should be settled at once."

Joseph A. Steinmetz then read the following paper on "Aluminum:"

Aluminum and Its Use in Cast Iron.

It is the purpose of this paper to treat of the subject only in a brief and general manner, in order that it may be brought to the attention of foundry interests, and in the hopes that this introduction will lead to further experiments with and uses of aluminum metal along the lines to be hereafter sketched. In all matters pertaining to aluminum, outside of the very narrow field of personal experience, it is necessary that reference be made from time to time to those sources of information and data which are of absolute authenticity. Therefore, it is with pleasure that I refer all who are in any way inerested in this metal to the first and only comprehensive work published upon this subject, entitled "Aluminum; Its History, Occurrence, Properties, Metallurgy and Applications, Including Its Alloys," by Joseph W. Richards, A. C., Ph. D., and professor of metallurgy at the Lehigh University. And from this excellent compilation will be made sundry quotations that are pertinent to the matter in hand.

I will not touch upon the subject of aluminum in steel castings, although it is well to state that for several years the bulk of the steel castings companies have been very large users of aluminum in their work. In fact several of the largest concerns use steadily as much as from one to two tons of pure aluminum metal per month. In all cases it is earnestly recommended to purchase pure aluminum, whether for steel or iron castings, for the reason that you can make your own ferro-aluminum alloys of absolute and unvariable proportions, and also, as a point of economy, to pay freight on the light weight pure aluminum, instead of the heavy alloy. We would, however, always recommend that the ferro-aluminum alloy be mixed with the molten metal, as in this form the aluminum suffers less waste than the pure metal and assimilates more easily and more thoroughly with the pour.

The high price of aluminum has heretofore been the great barrier to its general use in cast iron foundry work, but this is no longer the case, as there can now be furnished the purest 98 to 99 per cent metal at a price that puts it within the economical use of all foundrymen, considering the advantages to be derived from its use.

As early as 1858, when the metal was almost a laboratory curiosity, the possibility of this application was suggested, as soon as its price would warrant, and that time is now. Almost 30 years later, or in 1885, the discovery and publication of the Mitis process caused a very general interest among experimenters and certain foundries to determine the effects produced by aluminum on cast iron. The general advantages claimed by the exploiters of these processes, of the additions of pure aluminum and ferro-aluminum to cast iron, were very broad and attractive and may be correctly listed, for our consideration, under the following headings:

1. Makes the iron more fluid.
2. Makes hard iron softer.
3. Castings thus made are freed from hard spots and blow holes.
4. Lessens the tendency of the metal to chill.
5. Increases the resistance of the metal to chemical action.

It is also stated that while good soft iron is made more fluid, and benefited to some degree, yet the advantages of treating with aluminum are most evident with poor, hard, white iron. The above claims we will review in detail in the light of trustworthy experiments, which are properly certified.

It is now an unquestionable fact that the addition of aluminum very considerably affects the quality of the castings for the better. The method of adding it which has been generally adopted is to put some pieces of broken ferro-aluminum into the bottom of the ladle, preferably a hot one, and tap the iron from the cupola directly on to the alloy.

A German experimenter, states that it is important that the iron be not too hot when the ferro-aluminum is added, for if

it is white hot the aluminum burns with a greenish flame and a peculiar smell; a golden-yellow heat is recommended as the right heat for treatment. If the ferro-aluminum is thrown into the molten iron at this heat the streaks playing on the surface of the metal disappear, and the bath becomes blistery looking. While there have been many testimonials from practical men as to the benefits derived from the use of ferro-aluminum, testimonies so numerous that the fact of benefit has become indisputable, the only systematic investigation of this subject that is cited in Dr. Richard's work on aluminum, the text of which I have had the honor of quoting so frequently in the paper, is the series of comparative tests made by Mr. W. J. Keep, of the Michigan Stove Co., of Detroit, with the co-operation of Prof. C. F. Maybery and L. D. Vorce. Their results are embodied in two quite lengthy papers, one read before the American Association for the Advancement of Science, at the Cleveland meeting, Aug. 17, 1888; the other published in the transactions of the American Institute of Mining Engineers, December, 1889.

I refer to the papers as original investigations and to Dr. Richards' book, wherein said experiments are largely quoted, and as I shall take the bulk of my matter from these sources, it will be well to first explain the methods employed in pursuing these investigations. Two kinds of iron were used, having the following composition:

	White Iron.		Gray Iron
Silicon	0.186		1.249
Phosphorus	0.263		0.084
Sulphur	0.031		0.040
Manganese	0.092		0.187
Graphite carbon	0.95	3.22	
Combined carbon	2 03	0.33	
Total carbon	2.980		3.550

The ferro-aluminum used contained 11.42 per cent of aluminum and 3.86 per cent of silicon. The melting was done in a covered plumbago crucible, and the melt was run into test bars, one foot long, some having a section one-half inch square; others one inch wide and one-tenth inch thick. The ferro-aluminum was added to the molten iron, the smallest quantity first, and, after casting, part of this first cast was remelted with more ferro-aluminum, and so on. Another series of heats was made under exactly the same conditions, but without adding aluminum, these tests serving for comparison and determination of the true effect of adding the ferro-aluminum.

The general scheme of the tests consisted in adding 0.25, 0.50, 0.75 and 1.00 per cent of aluminum to the white iron, and 0.25, 0.50, 0.75, 1, 2, 3 and 4 per cent to the gray iron, the test bars being carefully examined as to strength, shrinkage, etc., and comparison made with the corresponding remelt of the iron alone. The weak point of the first set of tests, recorded in the first paper, was the fact that many of the changes credited to the addition of the ferro-aluminum might probably have been accounted for by the silicon in the alloy added, and so the results could not be accepted as demonstrating the influence of the aluminum except where the change was in a direction contrary to that which the silicon could have produced.

Mr. Keep recognized at once the necessity of differentiating the effect of these two elements, which was accomplished very ingeniously by finding an iron containing the same amounts of silicon, carbon, etc , as the ferro-aluminum, and making comparison tests with this iron in place of the aluminum alloy; also by adding pure metallic aluminum to the iron. Since Mr. Keep's method of presenting his results is in some cases not easily understood, Dr. Richards, from an inspection of his diagrams, recast these results into tabular shape, and reference and tribute is again made to the doctor's great work on "Aluminum."

Solidity of Castings.—All of Mr. Keep's tests bore on this point, but one particular test was made with white iron, adding only 0.1 per cent of aluminum (0.03 of silicon). The castings were of slightly finer grain, but blow-holes and interstitial cavities were noticeably absent, this accounting for the largely increased strength. The resistance to dead weight was increased 44 per cent, and to impact six per cent. No check test was made to eliminate the effect of the silicon added, but the effect produced was much greater than can with any probability be ascribed to the silicon alone.

Transverse Strength.—The addition of aluminum in the form of ferro-aluminum has the general effect of strengthening the iron, the white iron showing the greater improvement, and the resistance to impact being increased more than the resistance to dead weight.

The following table gives the percentage increase in strength in each case, the minus quantities in parenthesis meaning decreased strength:

Percentages of Aluminum.	White Iron.		Gray Iron.	
	Dead weight.	Impact.	Dead weight.	Impact.
0.25	32.5	82 8	—(12.5)	—(15.5)
0.50	128.0	291.0	— (8 9)	44.0
0.75	113.6	240.0	5.8	23.0
1.00	117.6	350.0	2.4	30.0
2.00			—(10.4)	29.0
3.00			4.6	11 0
4.00			15.8	13.0

Since, for every one per cent of aluminum added, 0.34 of silicon was contained in the ferro-aluminum, the question very naturally occurred, how much of this benefit was due to silicon? Tests were therefore made on this point, proving the part taken by the aluminum. The figures show the percentage increase in strength, as in the former tables:

Addition.	White Iron.	
	Dead weight. Per Ct.	Impact. Per Ct.
1 per cent. aluminum as ferro-aluminum	117.6	350.0
Cast iron, introducing the same quantity of silicon	126 8	94 6
1 per cent of aluminum, as pure aluminum	141.7	156.5

The conclusions to be drawn are, therefore, that while the silicon in the ferro-aluminum is sufficient to explain the increased resistance to a dead weight, yet the increase in resistance to impact is clearly due in large part to the aluminum.

Elasticity. —The closing of the grain of the iron on treatment with ferro-aluminum caused the iron to be less brittle, or more elastic.

The deflection of the different specimens for a fixed weight was measured, and the increase in deflection was found to be (in percentages):

Percentages Aluminum.	White Iron.	Gray Iron.
0.25	31	135
0.50	89	116
0.75	100	147
1.00	153	133
2.00		133
3.00		194
4.00		193

To distinguish the effect due to the silicon added, tests made with silicon and aluminum alone showed increased deflections, as follows:

Addition.	White Iron.
1 per cent. aluminum in ferro-aluminum	153
Cast iron containing an equal quantity silicon	11
1 per cent. aluminum as pure a uminum	100

It is thus proved that the increased elasticity is due to the aluminum, caused, as Mr. Keep believes, by a very uniform distribution of the graphitic carbon when aluminum is the element precipitating it.

Fluidity of the Iron.—The general conclusion from tests made is that with white iron small additions of aluminum, such as would be used in ordinary foundry pratcice, increase slightly the fluidity; one-half per cent of aluminum and over decreases the fluidity. Gray iron is rendered decidedly less fluid by any addition of aluminum.

Shrinkage.—The shrinkages of the various test pieces were carefully noted, with the general conclusion that the aluminum reduces the shrinkage, if enough is added. This development, though of interest, will not warrant a lengthy discussion, as the idea is to bear more upon the physical characteristics of the iron treated, as noted under headings of elasticity, soundness and strength.

Aside from the determinations of Mr. Keep and the other cases cited in Dr. Richards' book, many testimonials could be quoted from practical iron founders, if space would allow, as to the benefit to poor iron gained by adding ferro-aluminum. Perhaps one of the most striking results is the increased time which the aluminum-treated iron will remain molten. For instance, Mr. Keep found that 00.02 per cent of aluminum added to a ladle of iron caused it to keep fluid five minutes, while a similar ladle full of the same metal without aluminum became solid in half this time. This property of keeping fluid longer is of direct usefulness in a foundry where it is necessary to run a large number of small castings, during which operation there is usually much trouble in keeping the ordinary melt fluid, unless it was very hot to start with. The advantages therefore, are evident.

Dr. Richards cites the experience of a friend who described an experiment in which a large ladlefull of iron was tapped from a cupola and taken for pouring about 200 yards partly through the open air. The iron was not hot enough to fill the molds satisfactorily. Another ladleful, similar in all respects, was tapped immediately afterwards, some ferro-aluminum being placed in the ladle. This iron was taken to the same place for casting, filled the molds perfectly, and when brought back to the cupola the metal in the ladle was still fluid enough to make good castings.

The general results prove that the molten bath of iron will stay fluid twice as long when treated to aluminum as when run out as ordinary. The other considerations are that cleaner more solid and softer castings are universally obtained, and that with a large reduction in the percentage of defective castings. Therefore, after a judicious summing up, we would state boldly that very small percentages of ferro-aluminum added to unsatisfactory and poor iron will result advantageously. The field is open to investigations and further work along these lines, and we shall always be glad to give any one desirous of looking into this matter our best attention and advice.

At the conclusion of the paper Mr. Evans asked: "Why do the foundries not use aluminum more extensively?"

Mr. Steinmetz.—"The metal has only recently reached a reasonable price. It can now be had for 30 or 35 cents. At present it is mostly used by steel casting people."

Mr. Moore.—"We were making ice-machines several years ago, and we used aluminum with success in making castings that would stand the pressure of ammonia gas. After a while a man came along and wanted to sell me some aluminum. I said, 'We've been using aluminum,' and I showed it to him. 'Why, that's not aluminum,' said he. 'Well, whatever it is,' said I, 'it answered my purpose.' Shortly after that we stopped making ice-machines and I don't know to this day what the metal was that I was using for aluminum."

Mr. Steinmetz.—"At that time they were making a lot of compositions to imitate aluminum, but it hardly pays to imitate it now."

Augustus Williams, who was called upon for a paper, explained that he had no paper to read, but he came to deny that molders of 25 or 30 years ago were better than those of today. He made an earnest plea for the apprentice, urging that he should be well educated, and taught the value of temperance.

Shortly after the conclusion of Mr. William's remarks, the members adjourned to the roof garden where a lunch was served.

SINCE the resignation of W. R. Sterling as president of the Universal Construction Co., of Chicago, some time ago, that office has been vacant. At a recent meeting of the company Edward Haupt, formerly secretary, was elected president, and A. J. Singer was elected secretary and treasurer. Mr. Haupt, in addition to his duties as president, will fill the office of works manager, vice Fred Heron, who retired from that position April 1. The company operates the North Chicago plant of the Illinois Steel Co., under lease, and is engaged in a general structural and bridge building business. It has lately taken several good contracts for bridges and buildings, and reports a steadily increasing business.

AN engineer in a large factory calling the attention of a visiting expert electrician to the electricity in a big driving belt, was quite surprised when told that the electricity was caused by the belt slipping. The expert added that it was simply a wasting of power and could be prevented by applying belt dressing. This was done and the electricity disappeared at once. Dixon's traction belt dressing is manufactured by the Joseph Dixon Crucible Co., Jersey City, N. J.

THIRTY more Otto-Hoffman by-product coke ovens just completed at the Glassport plant of the United Coke & Gas Co., were fired last week, making 90 now in successful operation. The ovens now in operation produce about 630 tons of coke in 30 hours. Thirty more ovens now being constructed will be fired in another month.

ILLINOIS STEEL CO. CEMENT.

Cement has been made from blast furnace slag in Europe for a long time, and it has proved in important work to stand as well as old established brands of ordinary Portland cement, placed alongside it. It remained for the Illinois Steel Co. to take up the manufacture of slag cement on a commercial scale in the United States. The introduction of the product being thus undertaken by a company which had already earned a high reputation for the excellence of its other products, this cement, under the trade name of Steel Portland cement, at once attracted the attention of architects, and engineers. In a comparatively short time it has become a factor of no little importance in the cement world.

The Illinois Steel Co. has just published a pamphlet containing some description of the cement together with letters of recommendation from architects, engineers and contractors. In the pamphlet the company has the following to say about this product:

"There is a striking similarity, both chemical and physical, between blast furnace slag, the material from which Steel Portland cement is chiefly made, and Puzzolanic lavas, the basis of the famous old Roman cements. These have not deteriorated during an exposure of 20 centuries, the walls of the Coliseum of Rome, and of other celebrated buildings, being in first-class condition. On account of this similarity, and owing to the fact, shown by tests, that Steel Portland cement continually increases in strength with age, the Illinois Steel Co. believes, with good reason, that its new product will, like the celebrated Roman cements, successfully stand the test of time. The serious opposition which slag cement has hitherto encountered has been mainly due to two causes: First, its irregularity, and second, its slowness in setting, requiring from five to 24 hours to harden. The first difficulty arises chiefly from the fact that the slags of Europe are of themselves not at all uniform in composition. Furthermore, the slag-producers of Europe are seldom the cement manufacturers, and as the former consider the product of the latter merely of secondary importance, there is little effort made to produce a uniform slag, and consequently a uniform cement; the result is an article not to be depended upon, though at times of striking excellence. With the Illinois Steel Co., however, the case is very different. Its slag is made from the purest and most regular ores in the world, and these ores are bought with special view to their qualifications for making regular slag of the composition best suited to the manufacture of cement. Moreover, before the material is used, each lot is submitted to the most careful chemical analysis, and all material not of the correct composition is absolutely discarded.

"The second difficulty, that of slow setting, is overcome by patented as well as secret improvements in the process, making it possible to control the time of hardening of the finished product so that it will fulfill the requirements of almost any class of work. Steel Portland cement has been used successfully in bridge construction; in the erection of large and important office buildings; for heavy concrete-work of all kinds, including foundations for engines, etc.; for fireproofing of buildings; for lining mud-drums of boilers (a most severe test); for laying brick and stone; in short, for nearly all purposes requiring a high grade Portland cement. On account of its high tensile and compressive strength—due to the fineness to which it is ground—it is particularly well adapted for these classes of work, but, also on account of its fineness, it has comparatively low abrasive strength, and therefore is not so well suited for granitoid work as are some other brands in the market. Sidewalks giving perfect satisfaction to their owners have been laid, however, but it is not the intention at present to compete in this class of work.

"Appreciating the fact that its reputation as a steel-producer must not be jeopardized by a failure of one of its other products, and realizing its responsibility to the building trade in general in vouching for a new cement, the manufacturers submitted this material for several years to practical as well as theoretical tests before placing it upon the market. That Steel Portland cement is today giving the very best satisfaction is evidenced by the high character of the letters printed herein, and that the Illinois Steel Co. has the greatest faith in the future of the product is shown by the fact that the capacity of the plant is being increased as rapidly aspossible."

ADVANTAGES OF COMPRESSED AIR.*

BY JAMES F. LEWIS.

The largest compressed air plant in the country is at Quinnesec Falls on the Menominee river, the falls being 47 feet in height and furnishing unlimited power, which has been harnessed by modern skill to do economic duty. This plant consists of three pairs of Rand air compressors, 32 in. diameter by 60 in. stroke, and one pair 36 in. in diameter by 60 in. stroke, delivering 3,000 h. p. through three and one half miles of pipe to the Chapin and Ludington iron mines at Iron Mountain, for pumping, hoisting and motive power engines above ground, and direct acting pumps and rock drills below ground. This power is carried through a 24-in. pipe, with a loss of only one pound in pressure, and the superintendent figures that he gets an efficiency of 75 per cent.

The second largest plant is at the Calumet & Hecla copper mines. They have three pairs of compressors, 28 in. diameter by 48 in. stroke, 32 in. diameter by 48 in. stroke, 36 in. diameter by 60 in. stroke, respectively. During the first craze for electricity, the company refitted their mines with electric power. After working it two or three years they became convinced that it was costing them much more money than when they used compressed air; therefore the electrical machinery was discarded and they returned to the use of air.

Until quite recently the mine owner has taken no thought as to the economy or efficiency in compressed air, feeling that it was a necessity and caring little about the cost, so long as it enabled him to prosecute his work, but during the last three or four years, there has been a great change in this respect. The mining engineer has been looking carefully into the question of economy and the manufacturers find with pleasure that they are willing to pay for the highest type of air compressors. The same may be said also of contractors.

They are fast becoming educated by experience to the fact that there can be a great saving made by using the most economical machinery for their work.

The Chicago Drainage Canal has been a great educator in this respect. It was a long time before the contractors on that work could be convinced that it was economy to use compressed air as a power on open work against steam. Finally, however, Mason, Hoge, King & Co., and E. D. Smith & Co., were persuaded to purchase compressed air plants, but before they could be installed, the work had been prosecuted for six months by the use of a number of small steam plants scattered over the mile sections. The air plants were installed in the center of the section, and the air carried in pipes along the banks of the excavation, and after working six months with compressed air, they were fully convinced that it was at least 20 per cent cheaper than the use of steam for the same work. Therefore, 10 rock sections out of 14 were worked with compressed air; the other four with steam. Data thus obtained show conclusively that air was the most economical. The cost of drilling with steam was 8.64c. per cubic yard of rock, with air 6.30c. per cubic yard of rock. Two of the contractors had the courage to purchase a high type of air compressor and the saving in their coal pile was greatly to their advantage, and very soon paid for the extra cost of the compressors.

Great progress has been made during the past four or five years with compressed air as a power in mechanics. In fact, it is fast becoming universal for use in machine shops, boiler shops, foundries, railway shops, bicycle shops, and also for deep well pumping. There is yet much skepticism as to its economy or efficiency for mechancal purposes, but a great change of opinion has been and is taking place among many of our most thoughtful mechanical engineers. They are becoming converted rapidly in favor of compressed air. They find no end to its uses, after it is once introduced into the shop or foundry. The advantages of it as a motive power in shops are numerous. It is easy to handle, it is clean and neat, it is always ready to do its work the moment the throttle is opened; it can be carried from one end of the shop or yard without loss, if properly piped.

It has been considered until quite recently rather of an expensive power, because railway shops have labored under the same impression, as mining men—that any old cylinder or machine was good enough to make compressed air. For instance—you will find railway shops using five or six locomotive pumps that produce from 50 to 60 cubic feet of free air per minute. This means an investment of $600 or $700, tied up on the wall. With an air compressor, that would not cost over $500, they can produce double this quantity of air with one-fifth the amount of steam. Many railway shops are being fitted up with the most economical air compressors, and mechanics are becoming ready to testify to its efficiency and great saving over other powers. Four or five years ago, the Messrs. Cramps installed a large economical air compressor in their shipyard, piping the air throughout their works. They say today that it has been one of the greatest money saving machines they ever purchased.

Mr. J. H. McConnell, superintendent of motive power of the Union Pacific Railway, furnished the following interesting and reliable figures showing what can be done by the use of compressed air in shops. He says:

The many savings through the use of air in shops of the Union Pacific system aggregate $10,000 per year in labor alone. Savings per day:

Putting wheels in wheel lathe, three lathes in the shop, an average of one change a day, save one man in handling this work	$ 1.60
Hoisting steel tired wheels and axles in lathe, an average of six changes a day, save in one hour in time, 20 cents, and one man less to handle the work, $1.60	1.80
Hoisting axles into cut-off lathe, an average of ten changes a day, save one hour per day in time	.25
One large boring mill averages two changes a day, $1.60, saving of time of 30 minutes and the use of one helper, 15 cents	1.85
Handling cylinders in large boring mill and planer, save the labor of one man and one half hour each change	1.60
Three men working on pistons, etc., in raising them from the floor to the bench, serving three machinists, save one helper a day	.85
Raising chucks, face plates and other heavy work, air hoists in the machine shop save one helper a day	1.50
Lifting driving wheels and other heavy work on the large slotting machine, save the time of one man and 20 minutes	1.50
In applying cylinders on boilers, save one machinist and helpers' time of 10 hours	2.40
Facing valves save helper's time of four hours	.60
Pressing on driving wheels and axles, etc., three less helpers, one hour each	.45
Boring out cylinders, three helper's time, four hours	1.80
Applying driving brakes to old engines, drilling holes, reaming, etc., saving 15 hours of time of machinist and helper	6.70

Pneumatic tin and galvanized iron press, in getting out stock for 20 dozen water buckets, in eight hours, where it previously took 40 hours.

In making brake shoes, stamping a loup to have casting run on, previously one man would do 200 in a day, where he now does 600. All work on this machine saves in the neighborhood of from 50 to 60 per cent.

Running foundry elevator with the air hoist saves 25 per cent of one man's time.

Save 75 per cent time putting in stay bolts in a fire box, by using air motor for tapping out holes and screwing in bolts.

Save in the neighborhood of 50 per cent in using pneumatic hammers for caulking both flues and boilers.

Taking engines in and out of round house when necessary to change them saves the work of six men pinching, possibly 45 minutes, not counting the delay of the men waiting to go back to work on the engine.

Blowing out engines with air saves a cord of wood, besides the inconvenience and delay, as the men cannot work around a hot engine to advantage.

Handle all engines on the transfer tables by air, previously run by crank. One man does now what six did before, where six men move a foot in a minute; air motor under like conditions will move 12 feet. As this is moved several times a day this is in itself a great saving.

Pneumatic hoist for unloading scrap at the foundry. The old method took six men 10 hours, under the same conditions with the hoist, two men will do it in four hours.

Unloading a car of wheels took six men half an hour; now three will do it in 15 minutes.

Sandpapering off a 50-foot bagge car by hand took in the neighborhood of 60 hours; now it takes 14 hours with the sandpapering machine.

Air jacks for raising and lowering freight cars now take one man three minutes, where previously it took two men 10 minutes.

Truck jacks to remove three pairs of wheels take one and a half hours; the old method takes six hours.

Cleaning a car by air saves ten per cent in time.

Air white-washing machine. Where it took 10 men five

*Extracts from a paper before the Federated Mining Institute of Canada, Montreal meeting, Feb. 3, 1897.

"WHERE IGNORANCE IS BLISS--"

Somebody is losing money and doesn't know it.

We attribute it to the fact that there are thousands of steam users who have never heard of the Cochrane Heaters, or, having heard of them, have not investigated them or compared them with those they do know. These Cochrane Heaters are better than the ordinary run—are better than the extra good—are better than any other appliance for a similar purpose that is sold on the market to-day, yesterday, or ten years ago. Perhaps we lack in modesty in saying this ourselves, as our customers have been and are saying it for us. But then until you happened to meet them you would be losing the advantage of a good thing—a very good thing—so we decided to pocket our pride and tell you direct. Not our word for it that these Cochrane Heaters can *thoroughly* free your exhaust steam from cylinder oil, (there are nearly a thousand of our oil separators you can refer to before you need fall back on us) that they can heat water about as hot as exhaust steam can make it, can give you "real purification," etc., and do all this without getting out of order. What do they cost? Oh! They're gilt-edged! Ask us, stating how much water you want to heat, how much exhaust steam you have and whether you want to heat your building or a dryer.

Nearly 12 years ago we commenced building these Cochrane Heaters.

HARRISON SAFETY BOILER WORKS,

PHILADELPHIA, PA.

days, it now takes four men one day, and a 75 per cent better job.

New applications of compressed air are made daily, two of the most recent being an air motor attached to a differential hoist, and a portable stay-bolt cutter, that can be operated in the hands of one man, thus doing away with the cumbersome affair hung on a post.

Mr. F. L. Wanklyn, master mechanic of the Grand Trunk Railway system, has been greatly interested in the use of compressed air for a long time, and has made it quite a study so far as he could with the machine that the company was willing to give him, which consists of an old engine taken out of the scrap heap, to which he fitted an air cylinder.

The uses to be found for compressed air seem to be inexhaustible as far as a machine shop is concerned, as hardly a day passes without some suggestion being made for a new and advantageous application of this handy and expeditious system of transmitting power. 1. For hoisting. 2. For running small reciprocating engines and rotary motors for drilling and tapping especially in connection with staybolting of fire boxes, also for facing valve seats and reboring cylinders. 3. For breaking stay bolts when removing old inside fire boxes. 4. For cutting off projecting ends of new staybolts prior to riveting. 5. For chipping and caulking, and driving and snapping tank rivets. 6. For whitewashing. 7. For operating molding machines. 8. For testing air brake apparatus, and blowing through air and steam pipes. 9. For supplying necessary blast in connection with oil gas furnaces for setting and removing tires. 10. For supplying blast to riveting fires in portable forges. 11. For operating cinder hoist in connection with roundhouse ash pit. 12. For operating small pneumatic jacks to take the place of the holder-up in riveting over firebox staybolts.

The Massey Harris Co., of Toronto, Ont., say:

We are using this air compressor in connection with burning oil fuel in our smith shop. We have for some years been using oil for fuel instead of coal. Last week the writer spent some hours in the factory of Wm. Deering & Co., Chicago, where they are using compressed air for hoisting cranes, which seems to work very nicely indeed. The heavy flasks in the molding shop and the molten iron are lifted by these pneumatic hoists as well as the heavier castings in the machine shop. They are also to a limited extent using it for ramming the sand into the molds, etc. We have no doubt it will be used to a very much greater extent in the near future than it has been in the past. So far as using it in connection with oil fires is concerned we may say that after some six years' experience with oil we would not go back to coal under any consideration.

Compressed air as a power has certainly proven itself worthy of consideration, and to be produced economically, it should be treated on the same basis that a mechanical engineer would treat the question of economy in a steam plant. I am happy to say that there have been rapid strides in this direction during the last two years. There is no question that compressed air can be produced and utilized with as much economy and as great efficiency as any other power by simply putting in economical machinery for producing it.

JULIAN L. YALE & Co., 1117 the Rookery, Chicago, have been appointed Western sales agents of the Damascus Bronze Co., of Pittsburg, manufacturers of all grades of Damascus and phosphor bronze for car and locomotive bearings, stationary and marine engines and rolling mills, lined bearings for passenger and freight car service, and all grades of Babbitt metal.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

The Fessenden Mfg. Co., of Pittsburg, has been chartered for the manufacture of machinery and electrical devices and appliances. The incorporators are D. N. Seely, John F. Tener, Norman L. Tener, J. G. Wainwright, F. H. Seely.

The Ontario Iron & Steel Co. has been incorporated at Camden, N. J. The object of the corporation is to manufacture tin plate, coke and conduct iron foundries. The capital stock is $500,000, and the amount paid in is $100,000. The corporators are: D. C. Laub, Philadelphia; W. M. C. Jones, Pittsburg; F. Prottman, Allegheny; J. Reuben Roat, Zelinople, Pa., and George W. Ring, Camden.

C. J. Fred, formerly of Fernstrum & Fred, Menominee, Mich., has started a boiler shop at Iron Mountain, Mich.

D. W. Burns, of Marshfield, Wis., and Jacob Schiller, of Neillsville, Wis., have formed a partnership under the firm name of Burns & Schiller Nashville Steam Boiler Works, and have located at Nashville, Tenn.

Bailey & Martin, West Point, Miss., will buy machinery used in manufacturing bicycles.

Bids will be opened May 1 for 77,320 pounds of iron and steel for improving Kentucky river. James F. Gregory, major engineers, Cincinnati, O., will furnish specifications.

N. K. White & Co., Richmond, Va., wants a second-hand engine lathe from 18 to 24-inch swing and ten feet between centers (screw cutting).

New Construction:—

The Standard Oil Co. is about to erect at Bayonne, N. J., a boiler shop 300 ft. long and 105 ft. wide. The main portion of the shop is divided into three bays. The central bay about 50 ft. wide is served with a 15 ton electric crane supported on heavy girders about 40 feet above the floor. On either side of shis main portion is a wing 30 ft. wide. The walls of the building are brick and the supporting frame work is steel. The roofs are to be covered with corrugated iron. The main columns of the shop are 25 ft. apart and all arranged so that jib cranes of suitable size and capacity can be attached at any point, which together with the traveling crane in the center will enable them to cover the entire floor surface of the building. One end of the building for a distance about 75 ft. in length is supported by clear span trusses which gives a clear floor space over this entire area. In this end of the building will be located fires and furnaces, and other apparatus for heating and shaping the material for the boilers. The building is well lighted by windows in the sides of the brick walls and in the monitors of the roof and is ventilated by means of large monitors on the ridge. The steel work was designed and will be erected by the Berlin Iron Bridge Co., of East Berlin, Conn.

The Carnegie Steel Co. has completed plants for a new mill at Duquesne, which will cost $250,000, and employ about 400 men. It will be a finishing mill when the plant is manufacturing rails, and when the plant is making billets will manufacture spikes, splice bars, etc.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁑ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

DUCTILE CAST IRON

TENSILE STRENGTH 60,000 LBS.

HOMOGENEOUS, SOLID AND CLEAN.

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At Jacksonville, Fla., John G. Christopher will erect a foundry and engage in the manufacture of machinery.

The Delaware, Susquehanna & Schuylkill Railroad Co. is building a new car shop at Drifton, Pa.

Additions, Enlargements, Removals, Etc.:—

Geo. W. Knopf, Pittsburg, has the contract for an addition of 160 feet to the plant of the Washington Sheet & Tin Plate Co., Washington, Pa. The engine and fly-wheel will be duplicated. The present boiler has a 32-inch cylinder, and a 60-inch stroke; the new one will have the same stroke and a 28-inch cylinder. A new tinning house will also be erected, and a large warehouse. The capacity of the works will be about doubled, three stands of rolls being added.

A large addition is being built to the Seymour Mfg. Co.'s tube works, at Seymour, Conn.

Fires and Accidents:—

Fire in the office building of the Brown Hoisting & Conveying Machine Co., Cleveland, April 7, caused a loss of $5,000, covered by insurance.

The Stoddard Machine shop, at Gloucester, Mass., was destroyed by fire, the building and machinery being ruined. Loss on the building and contents, $20,000; insurance, $9,500.

General Industrial Notes:—

Spearman furnace, of the Spearman Iron Co., at Sharpesville, Pa., has been banked down for an indefinite period.

The Joint Traffic Association managers have fixed the rate on iron and steel and manufactures thereof at 12 cents per 100 pounds from the mills to the Canadian frontier.

William and Arthur Pugh have sold their half interest in the Racine Malleable & Wrought Iron Co., at Racine, Wis., to John P. Davies, who is now sole owner. The plant employes over 200 men.

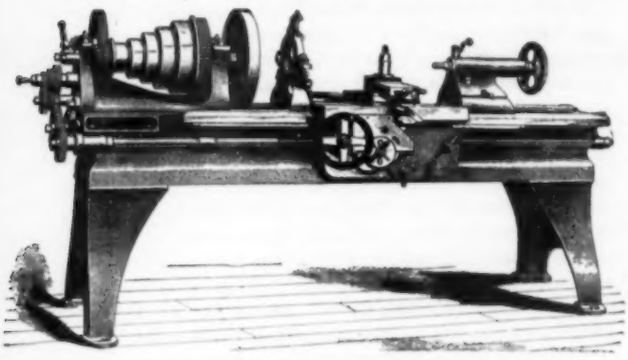
A verdict for $76,154.48 has been rendered for the plaintiff in the case of the Pittsburg Iron & Steel Engineering Co., against the National Tube Works Co., for an action on a contract for the erection of a Bessemer steel plant for the defendant company.

Rosena furnace, at New Castle, Pa., which has been operated by M. A. Hanna & Co., for the past three years, will pass into the hands of the Oliver & Snyder Iron & Steel Co., in May, when the ores in stock have been worked up.

Jones & Laughlins, Pittsburg, have just placed an order with the Morgan Engineering Co., of Alliance, O., for three ten-ton electric traveling cranes. Two will have a span of 40 feet, and the third 80 feet.

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.



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All business connected with the sale of the above brands of Charcoal Pig Iron will, from April 1st, 1897, be handled by THE SUPERIOR CHARCOAL IRON CO., of Detroit, Mich., which is thus enabled to supply the best iron known for all purposes, especially for Car Wheels, Malleable Castings, Boiler Tubes, Ship and Armor Plate, strong high Silicon for foundry purposes, Basic Pig Iron with the minimum of Silicon and Sulphur, also iron to take the place of Salisbury, Southern, and Swedish Charcoal Iron.

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Office, 66 Newberry Bldg., DETROIT, MICH.

At Hokendauqua, Pa., No. 1 furnace of the Thomas Iron Co. is being relined.

Citico Furnace Co., Chattanooga, Tenn., is making extensive improvements to its furnace at Rockwood, Tenn. A new hot blast stove will be put in.

Some good work has been closed of late and the Phoenix Iron Co.'s plant at Phoenixville, Pa., will shortly be started full time.

The Lebanon Mfg. Co., Lebanon, Pa., has on hand large orders for castings, which will keep it steadily in operation for some time.

The Newport Rolling Mill Co. has started up its sheet mill at Newport, Ky.

The rolling mill of the Eagle Iron Works, at Roland, Center County, Pa., has been dismantled. The mill was built in 1830, and contained one single puddling furnace, one heating furnace, and two 15-inch trains of rolls. The plant was operated by water power, the product being wire billets and bar iron, the annual capacity being 2,700 gross tons.

An official of the Lackawanna Iron & Steel Co. is quoted in denial of the telegraphed report that negotiations are pending for a deal between the Lackawanna and Carnegie companies or for any arragement for the rolling of product for one compay at the plant of the other.

The Pennsylvania Steel Co. has just put its No. 4 furnace in blast after long idleness. Two stacks are now in blast.

The Payne Engineering Co., composed of Messrs. Stephen H. and Norman B. Payne and Albert G. Duncan, who was formerly with Westinghouse, Church, Kerr & Co., has been organized, and will handle, as sole agents, the Payne steam engines, which will hereafter be manufactured by the Wright Steam Engine Works, Newburgh, N. Y.

The plant of the Troy Steel Co., of Troy, N. Y., will start up.

The furnace of the Northwestern Iron Co., at Mayville, Wis., has been blown out.

The rolling mill of Mitchell, Trauter & Co., Covington, Ky., has resumed operations in all departments.

The puddling and bar mill departments of the Reeves Iron Co., Canal Dover, O., which have been idle for six months, have been started up again. The company is said to have secured sufficient orders to run double turn for some time.

The New River Mineral Co., Ivanhoe Furnace, Va., has put its furnace in blast.

Rebecca furnace of the Kittanning Iron & Steel Co., Kittanning, Pa., has been blown in.

Princess furnace, Glen Wilton, Va., has been blown out.

Work on the new Bagley coal and coke plant near Youngstown, O., and Latrobe, Pa., is being pushed. The excavation is for 275 ovens. The Lippincott branch of the Pennsylvania Railroad will be extended to the works.

The Ellwood Ivins' Tube Co., Oak Lane Station, Philadelphia, and main office 487 Broadway, N. Y., is moving its Chicago office from Rookery Bldg., and opening larger quarters and a warehouse on Lake st., that city, where it will carry a full stock of its seamless steel tubing. The Chicago stores will be under the management of George G. Spencer. The company is also negotiating for an office and warehouse in Boston.

The report that the sheet mill at Hammond, Ind., belonging to the Corning Steel Co., has been leased to another company, is denied by Charles Corning. Negotiations looking to a lease of the mill are in progress but have not been consummated as yet.

The strike of puddlers at the plants of the Oliver Iron & Steel Co., and A. M. Byers & Co., Pittsburg, were settled last week, the union men accepting the $4 rate of puddling.

Sales of iron by the Tennessee Coal, Iron & Railroad Co. in the week ending March 27, were 26,105 tons, of which 5,200 tons went abroad, making 11,700 tons sold in Europe in two weeks.

At Wheeling, W. Va., United States Circuit Court, before Judge Jackson and a jury, the trial began on April 7 of the suit of the Barnum-Richardson Co., against the Ensign Car & Mfg. Co., of Huntington, W. Va., to collect $20,000 royalties, claimed on a patent used by the Ensign Co. in the manufac-

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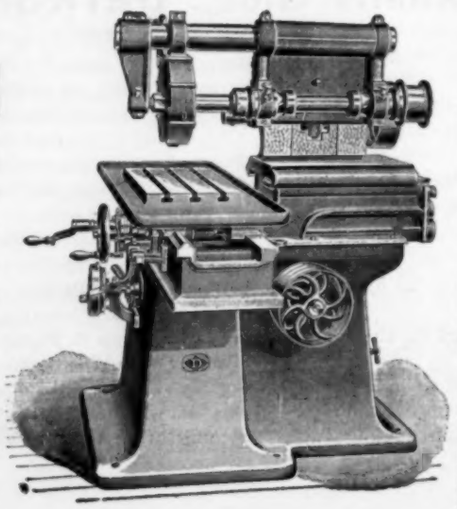

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27 VINCENT ST., CLEVELAND, O.
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ture of chilled car wheels. The royalty claimed is five cents on each wheel made under the patent, which expired last month.

The report of a strike at the Mahoning Valley Iron Co.'s plant at Youngstown, on account of recent reductions, is denied. Two engineers gave up their positions, but the plant is being operated as orders come in. The puddle mill has shut down because of accumulated muck iron. The large plate mill is idle, awaiting orders. It is reported that a three-high mill will be built in the old puddle mill.

The Lebanon Rolling Mills, Lebanon, Pa., made an assignment April 7, to Samuel E. Light, their president, and M. H. Leonard, of Philadelphia. The instrument conveys all the company's property, and is assigned by Samuel E. Light, president; James H. Roberts, secretary, and Richard Meily, treasurer. Samuel E. Light said that the assignment is attributable to the necessity of the firm carrying $43,000 of notes drawn by other firms who have since assigned or failed. The assets are in excess of liabilities, and reorganization of the company will take place soon.

Employes in the plate mill and the tube department of the Riverside mills at Benwood, W. Va., refused to accept the reduction. The management responded that it could make no concession from the original announcement. The men decided to quit work, and instructions to that effect were circulated among the tube workers and the plate mill men. The management also posted notices in the steel works that that department would be closed down for an indefinite period. This action anticipated the decision of the steel workers, who did not expect any reduction to be made until the 28th.

The committee of the 200 striking employes of McIntosh, Hemphill & Co., Pittsburg, who were reduced ten per cent with an increase in hours, has been unable to come to an agreement with the company.

The Columbus, Hocking Valley & Toledo Railroad has bought 2,000 tons of rails for fall delivery.

Excelsior Furnace, at Ishpeming, Mich., is preparing to resume about May 1. A new hearth is being built and the furnace put in good condition under the direction of Supt. W. H. Nelson.

At Cincinnati, Charles J. Stiles & Co., manufacturers of iron measures, etc., assigned to J. S. Hastings. Liabilities, $45,000; assets, $60,000.

The rod mill of the New Castle Wire Nail Co., New Castle, Pa., turned out 178 tons of rods in one 12-hour turn in March, this being above previous records. For the month of March the output was 7,451 tons of all sizes of rods.

At the New Castle Steel & Tin Plate Co.'s works, New Castle, Pa., 15 employes in the pickling department struck for fewer hours. Their places were filled. A set-to between the strikers and the new men occurred, but the latter are still at work.

At one of the Andrews & Hitchcock Iron Co.'s furnaces at Hubbard, O., a new bosh is being built.

Some new stoves are being built at Carrie furnaces, Rankin, Pa.

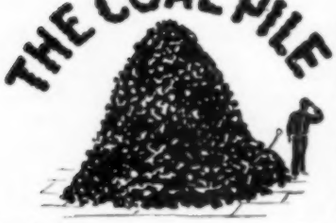
THE straighteners and chippers at the South works of the Illinois Steel Co. struck for higher wages the first of last week, alleging that on the sliding scale basis, under the low prices at which rails had been selling, they could not make living wages. The company is working under an arrangement with the Amalgamated Association, and immediately notified the officers of the Association that men were needed to fill the places of the strikers, as they had violated their agreement. The first of this week the new men were ready to go to work, and the plant was started up again after being idle only a few days. The strike was made by only 48 men, and the trouble was really more between them and the Amalgamated Association than between the men and the company, as the reduction of wages against which the men struck was simply in accordance with the sliding scale under which the Association had agreed to work. No further trouble is expected.

THE annual meeting of the stockholders of the Pittsburg Bessemer & Lake Erie Ry. was held last week in Pittsburg. John G. A. Leishman retired from the board of directors and William N. Frew was elected to succeed him. At a meeting of the directors on last Friday the old officers were re-elected and the issue of $10,000,000 worth of bonds was authorized. The bonds, as originally planned, will be used to cancel all outstanding bonds of the old company and to complete the construction of the road.

THE Chicago office of the Rand Drill Co. has sold a large duplex air compressor to the Wolverine Copper Mine Co., at Allouez, Mich.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*



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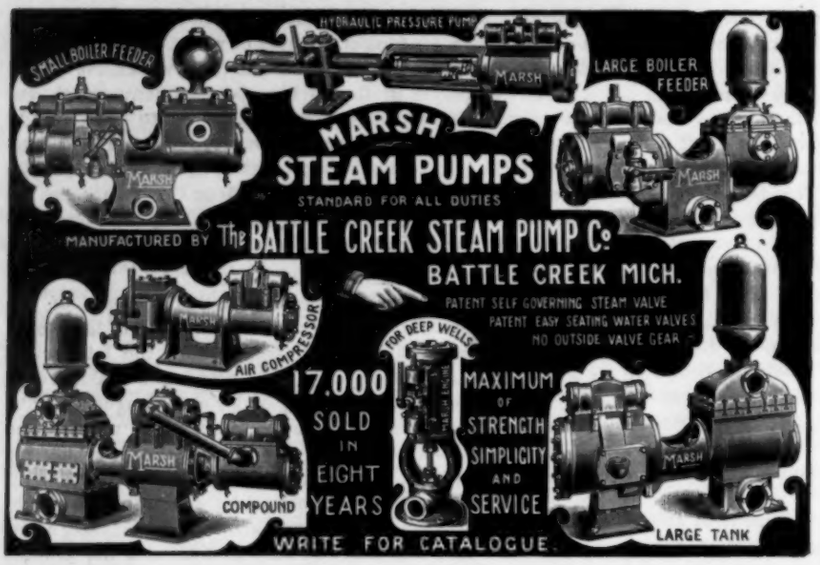

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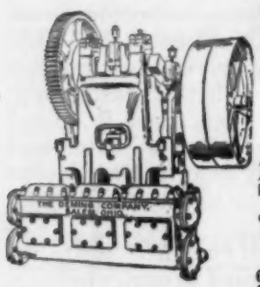

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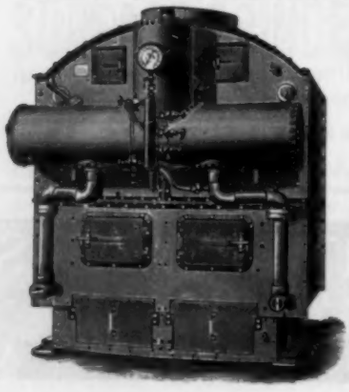

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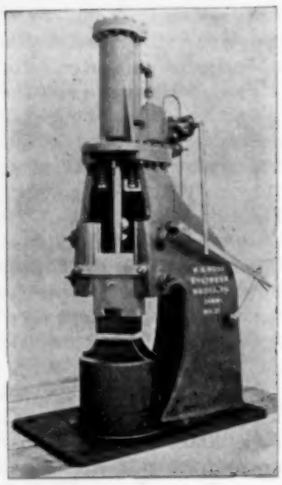

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Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

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FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
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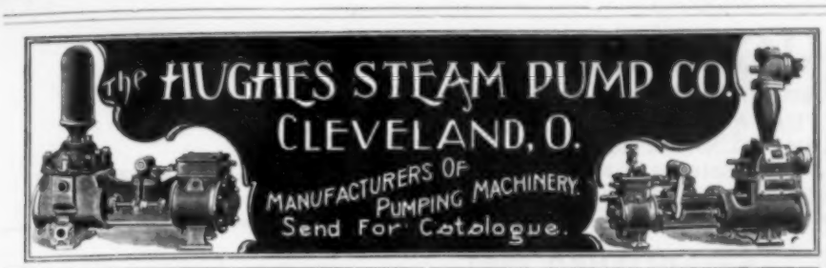

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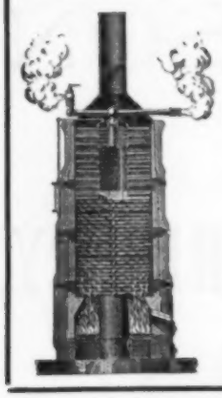

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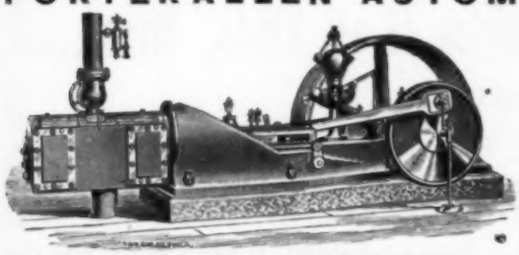

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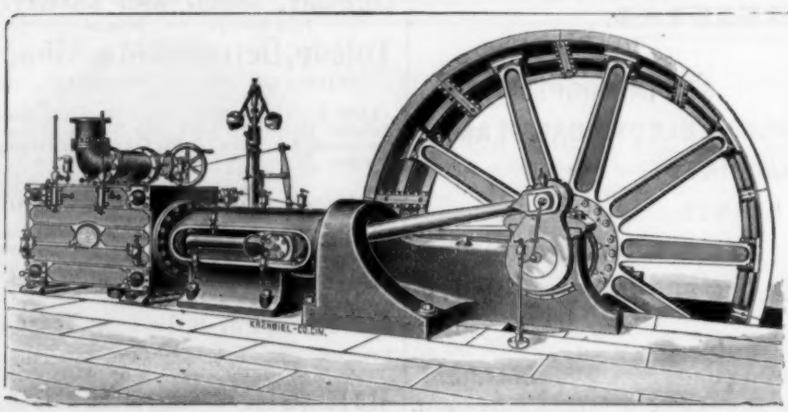

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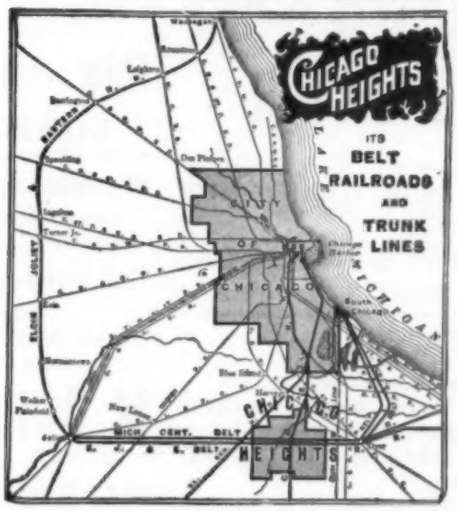

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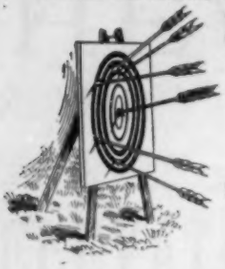

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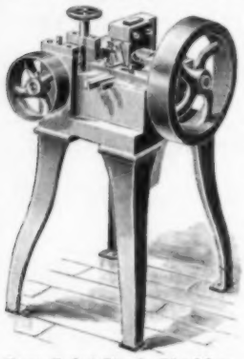

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Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flasks—
Brass Founders' Supply Co., Newark, N. J.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati

Foundries—
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
The Rippel Mfg. Co., Mt. Gilead, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
East Chicago Foundry Co., Chicago.

Foundry Supplies—
Newport Sand Bank Co., Newport, Ky.
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
F. B. Stevens, Detroit, Mich.
Brass Founders' Supply Co., Newark, N. J.
The Ohio Sand Co., Conneaut, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Friction Metal—
Magnolia Metal Co., New York City, N. Y.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
Kurtz & Buhrer, Foundry Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hammers—
Beaudry & Co., Boston, Mass.
Wm. H. Wood, Media, Pa.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

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B. F. Sturtevant Co., Boston.

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The Lane & Bodley Co., Cincinnati, O.

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Wm. H Wood, Media, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

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C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
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Ogiebay, Norton & Co., Cleveland.
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M. A. Hanna & Co., Cleveland, O.
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Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
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L. S. Starrett Co., Athol, Mass.
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Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

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Marion Steam Shovel Co., Marion, O.

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Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

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Link-Belt Machinery Co., Chicago, Ill.

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Cleveland City Forge & Iron Co., Cleveland.
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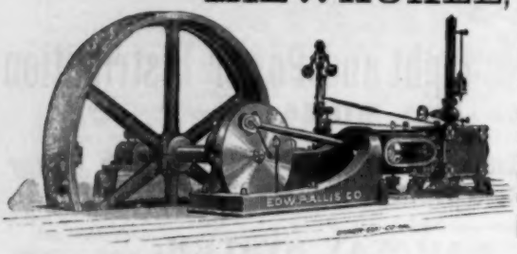

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IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4 50@ 4 75
No. 1 Bessemer hematite	4 00@ 4 25
Hematites No. 1 non-Bessemer	2 25@ 2 50
No 1. Specular, non-Bessemer	2 75@ 3 00

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Bessemer	$... ... 10 65
No. 1 Strong Foundry	10 65@ 10 90
No. 2 Strong Foundry	10 15@ 10 25
No. 1 Gray Forge, red short	... ... 9 50
No. 2 Gray Forge, neutral	... ... 9 75
No. 1 American Scotch	... ... 11 40
No. 2 American Scotch	... ... 10 90
Lake Superior Charcoal	... ... 13 50
PITTSBURG:	
No. 1 Foundry	$10 65@ 10 90
No. 2 Foundry	10 15@ 10 40
Gray Forge	9 15@ 9 25
White and Mottled	... ... 9 25
Warm Blast Charcoal	15 00@ 16 00
Cold Blast Charcoal	... ... 20 00
Bessemer	10 20@ 10 30
CHICAGO:	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	11 25@ 11 75
Local Coke Foundry No. 2	10 75@ 11 25
Local Coke Foundry No. 3	10 50@ 10 75
Local Scotch Foundry No. 1	11 25@ 11 75
Local Scotch Foundry No. 2	10 75@ 11 25
Local Scotch Foundry No. 3	10 50@ 10 75
Southern Coke No. 1	11 00@ 11 20
Southern Coke No. 2	10 25@ 10 45
Southern Coke No. 3	10 00@ 10 10
Southern No. 1 Soft	10 65@ 10 95
Southern No. 2 Soft	10 15@ 10 20
Southern Silveries	11 40@ 11 65
Jackson Co. Silveries	14 00@ 16 00
Ohio Silveries No. 1	15 00@ 15 55
Ohio Silveries No. 2	14 50@ 15 05
Ohio Strong Softeners	12 00@ 12 20
Alabama Car Wheel	16 00@ 16 55
Malleable Bessemer	11 50@ 12 00
Coke Bessemer	13 00@ 13 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	9 75@$10 00
Southern Coke No. 2 and No. 1 Soft	9 50@ 9 75
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	15 00@ 16 00
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 75@ 9 00
" " Mottled	... ... 9 00
Standard Alabama Car Wheel	14 75@ 15 50
Tennessee " "	13 50@ 14 50
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$... ...$12 00
No. 2 Foundry Strong Coke Iron Lake Superior Ore	... ... 11 50
Ohio Strong Softener No. 1	... ... 12 00
Jackson Co. Silvery No. 1	... ... 14 25
Lake Superior Charcoal	... ... 14 00
Southern Soft No. 1	... ... 11 50
Hanging Rock Charcoal	... ... 17 00
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$... ...$11 00
Southern Coke No. 2	... ... 10 50
Southern Coke No. 3	... ... 10 00
Southern Gray Forge	... ... 9 75
Southern Charcoal No. 1	... ... 15 00
Missouri Charcoal No. 1	14 00@ 14 00
Ohio Softeners	... ... 15 50
Lake Superior Car Wheel	... ... 15 20
Southern Car Wheel	... ... 15 25

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Old iron rails	$12 50
Old steel rails	10 50
Old car wheels	10 00
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No. 1 R. R. wrought scrap	$10 00
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No. 1 Machine cast scrap	8 50
Iron axles	14 00
Axle turnings	7 00
Wrought turnings (free from cast)	6 25
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

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Beams and Channels (f. o. b. Cleveland)	1.65c
Angles	1.25c
Tees	1.35c
Universal Plates	1.25@1.30c
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3 to 3½	.50 "
3⅝ to 4	.80 "
4¼ to 4½	1.00 "
4¾ to 5	1.30 "
5¼ to 6	1.80 "
6¼ to 6½	2.20 "

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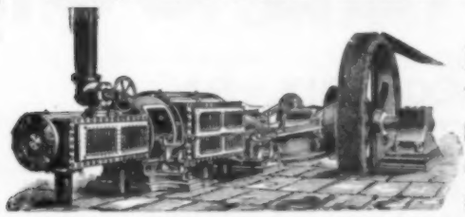

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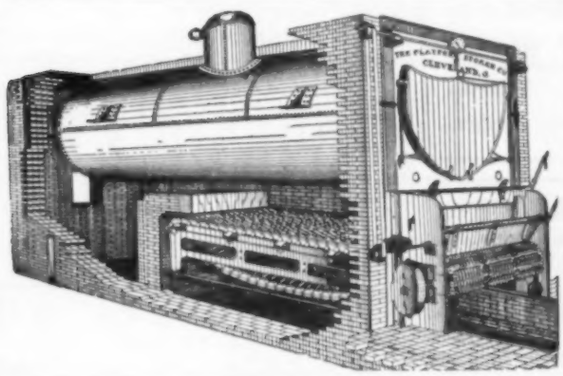

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Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

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And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¼	2.50 extra
¾ to ⅞	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.20 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1⅝	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1⅝	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅜ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅜ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1⅜ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅜	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4 50 "

Half Ovals less than ¾ their width in thickness, extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

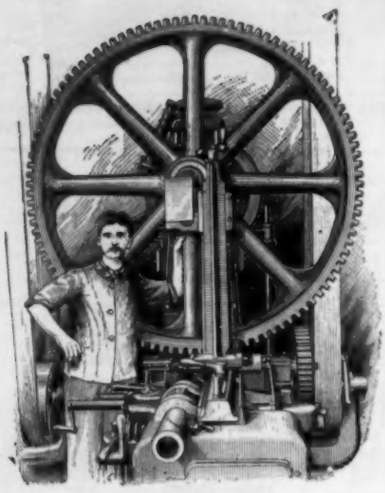
Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.
		Extras.
1⅜ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1⅜,	" 22	.25 "
1 ⅜ to 1⅜,	" 13, 14 and 15	.05 "
1⅜ to 1⅜	" 16, 17 and 18	.10 "

GEAR CUTTING



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In Iron, Steel and Brass

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Are you using gears?

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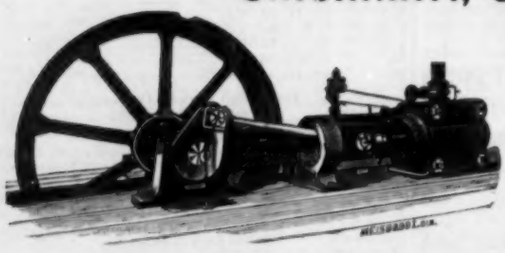

Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
3/8,	"	13, 14 and 15	1.00 "
3/8,	"	16, 17 and 18	1.10 "
3/8,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

The Link-Belt Machinery Co.

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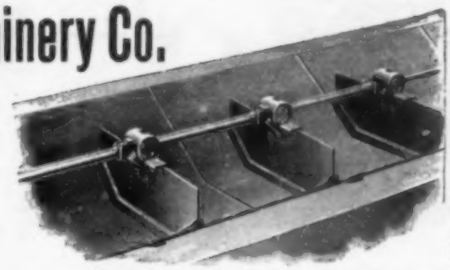

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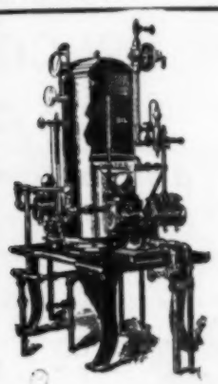

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Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

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General Freight Agent,
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Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	⅛c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1⅛c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ⅝ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 40
Open-hearth Tire	" 1 45
Open-hearth Spring	" 1 80
Sleigh Shoe	" 1 45
Toe Calk	" 1 90
Cutter Shoes, tapered and bent	" 1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¾ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 60
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s	.62
Butt " " " four 10s	.62½
Lap " galv. " four 10s	.52½
Butt " " " four 10s	.50
Boiler tubes 2¼" and smaller	.70
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 13

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper&Straight Shank to 1½"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 35
Drill Sockets	dis 35
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6¼c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 35
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 35
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3¾	3⅜
Hexagon	15½	11⅝	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4¾

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
Car lots.....$1.50
Less than car lots.....$1.60

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 6

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

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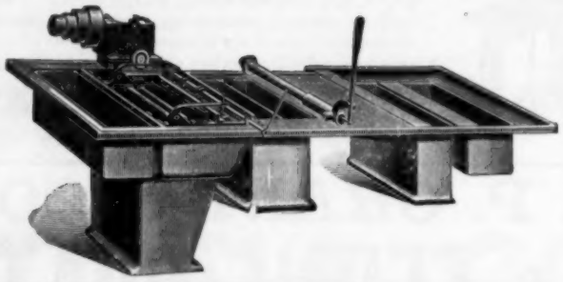

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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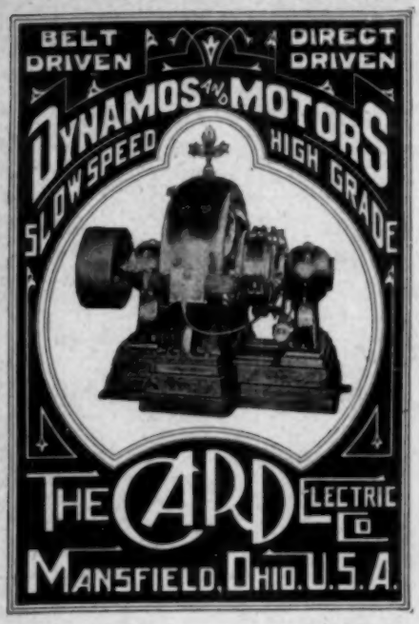

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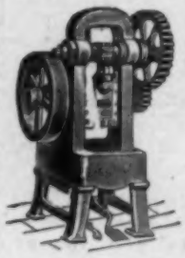
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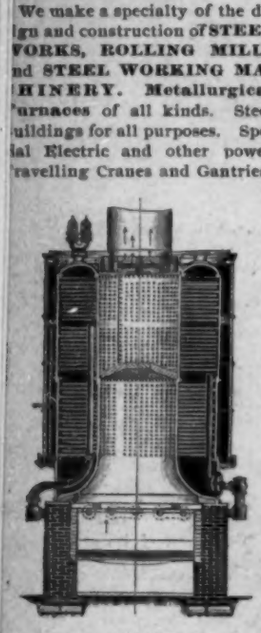

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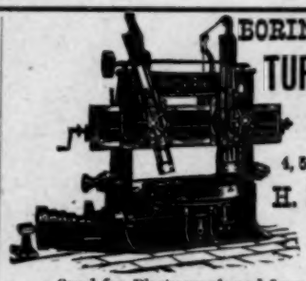

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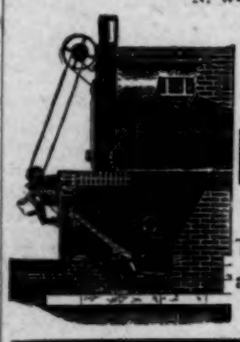

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